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ARCHITECTS:	**CPF/DOMENECH & HICKS, INC.** 155 MASSACHUSETTS AVENUE, BOSTON, MA 02115
STRUCTURAL ENGINEERS:	**WEIDLINGER ASSOCIATES, INC.** 44 BRATTLE STREET, CAMBRIDGE, MA 02138
MECHANICAL AND ELECTRICAL ENGINEERS:	**LeMESSURIER CONSULTANTS,. INC.** 1033 MASSACHUSETTS AVENUE, CAMBRIDGE, MA 02138
SITE AND LANDSCAPE ARCHITECTS:	**THE HALVORSON COMPANY, INC.** 161 MASSACHUSETTS AVENUE, BOSTON, MA 02115

THE FOLLOWING REVISIONS AND ADDITIONS ARE TO BE INCORPORATED INTO THE ROXBURY CORNERS HOUSING, BOSTON, MASSACHUSETTS DOCUMENTS DATED 8 DECEMBER 1989 AND PREPARED BY CPF/DOMENECH AND HICKS, ARCHITECTS INC., BOSTON, MASSACHUSETTS AND BECOME A PART OF THE DOCUMENTS ON THIS DATE 11 DECEMBER 1989. THEY ARE AS BINDING AS IF INSERTED IN ENTIRETY IN LOCATIONS AS DESIGNATED.

LATEST ADDENDUM GOVERNS WHERE CONFLICT OCCURS WITH PREVIOUSLY ISSUED MODIFICATIONS.

ACKNOWLEDGE THE NUMBER OF THIS ADDENDUM ON PROPOSAL AND CONTRACT FORMS.

CHANGES TO SPECIFICATIONS:

ITEM NO. 1: DIVISION 2, SECTION 02800 SITE IMPROVEMENTS:
Page 1, paragraph 1.02 DESCRIPTION OF WORK, subparagraph B, add new article 3 as follows:

3. Garbage can containers.

and page 2 add new paragraph 2.04 GARBAGE CAN CONTAINERS as follows:

2.04 GARBAGE CAN CONTAINERS:

A. Product: Tee-M Storage Systems, size indicated.
B. Manufacturer: JG Wilson Corporation.

and page 2, paragraph 3.02 INSTALLATION, add new subparagraph D. Garbage Can Containers as follows:

D. Garbage Can Containers: Set in place as indicated and securely attach to base as recommended by manufacturer.

ITEM NO 2: DIVISION 4, SECTION 04200 UNIT MASONRY:
Page 1, paragraph 1.02 DESCRIPTION OF WORK, subparagraph B, delete article 3. Precast concrete trim.

and page 4, delete paragraph 2.04 PRECAST CONCRETE.

ITEM NO. 3: DIVISION 5, SECTION 05120 STRUCTURAL STEEL:

Page 1. paragaph 1.02 DESCRIPTION OF WORK, add new subparagraph C as follows:

C. Prefabricated fireproofed columns where indicated are included as work of this section.

and page 3, paragraph 2.01 MATERIALS, add new subparagraph J as follows:

J. Prefabricated Fireproofed Columns: Fabricated of structural shapes, encased in 5000 psi concrete, contained in tubular steel shell with connections for anchoring to other steel as indicated; primed for paint finish.
  1. Product: "Fire-Trol" columns as manufactured by Lally Tubular, Div. of LB Industries, Inc.

ITEM NO. 4: DIVISION 5, SECTION METAL FABRICATIONS:
Page 6, paragraph 2.07 STEEL RAILINGS AND HANDRAILS, add new subparagraph J as follows:

J. Gate Hardware: Provide hardware for gates as indicated, including non-corrosive hinges and locksets suitable for exterior use and adequate to provide smooth operation for life of installation.

ITEM NO. 5: DIVISION 6, SECTION 06200 FINISH CARPENTRY:
Page 1, paragraph 1.02 DESCRIPTION OF WORK, subparagraph B, delete article 7. Railings.

and page 3, paragraph 2.02 MATERIALS, subparagraph B, delete article 3. Railings.

ITEM NO. 6: DIVISION 7:
Add new SECTION 07110 SHEET MEMBRANE WATERPROOFING as attached at end of this addendum.

ITEM NO 7: DIVISION 7, SECTION 07600 FLASHING AND SHEET METAL:
Page 1, paragraph 1.02 DESCRIPTION OF WORK, subparagraph B, delete article 3. Metal bay panels and article 4. Metal bay roofing.

and page 3, paragraph 2.02 FABRICATED UNITS, subparagraph B, delete articles 2 and 3.

ITEM NO. 8: DIVISION 7, SECTION 07800 ROOF ACCESSORIES:
Page 1, paragraph 1.02 DESCRIPTION OF WORK, subparagraph B, add new article 1 as follows:

1. Skylights.

and page 2, paragraph 2.03 UNIT MATERIALS, FABRICATION, add new subparagraph B as follows:

B. Plastic Skylights:
1. Sheet Thickness: Glazing plastic thicknesss required for 40 lbs. psf external and 20 psf internal loading pressures; comply with recommendations of AAMA Bulletin No. 1601.1.
2. Plastic: Cast acrylic with abrasion-resistant coating on exterior surface, for 2% maximum haze increase of 100 rev. on 500 TAber abraser (ASTM D 1044); 14,500 psi flexural stength; 180 degrees F. continuous service temperature.
3. Glazing Type: Double-sheet insulating units with average 1" minimum air space between sheets, manufacturer's standard hermetic edge seal.
4. Color, Exterior and Interior Sheet: Colorless transparent.
5. Glazing Frame, Retainer and Trim: Extruded aluminum.
6. Curb Frame: Manufacturer's standard formed or extruded aluminum, including cap flashing.
7. Glazing System: Manufacturer's standard.
8. Condensation Control: Fabricate units with integral gutters and nonclogging weeps, for permanent control of condensation on inside of glazing.
9. Design Type: Unit dome; size as indicated.
10. Manufacturer: Subject to compliance with requirements, provgide skylight units by one of the following:
    a. Hillsdale Industries, Inc.
    b. Naturalite, Inc.
    c. Wasco Products, Inc.

ITEM NO. 9: DIVISION 8 SECTION 08400 ALUMINUM DOORS AND FRAMES: Page 1, paragraph 1.02 DESCRIPTION OF WORK, subparagraph B, add new article 4 as follows:

4. Bay curtain wall frames.

and paragraph 1.03 RELATED WORK SPECIFIED ELSEWHERE, add new subparagraph D as follows:

D. ALUMINUM WINDOWS: Windows for bay window enclosures.

and page 3, paragraph 2.02 MATERIALS AND ACCESSORIES, add new subparagraph K as follows:

K. Glazing Panels: Manufacturer's standard flush-laminated panels of thickness indicated, fabricated with rigid closed-cell urethane core laminated with waterproof glue between two sheets of aluminum; matching adjacent framing.

and page 4, paragraph 2.05 FRAMING SYSTEM, add new subparagaraph D, as follows:

D. Fabricate bay window curtain wall assemblies as a complete unit as indicated, including frame, spandrel panels, roof and underside enclosure with suitable watertight flashings and adequate concealed fasteners to anchor to building frame.

ITEM NO. 10: DIVISION 8, SECTION 08520 ALUMINUM WINDOWS:
Page 1, paragraph 1.02 DESCRIPTION OF WORK, subparagraph C, add new article 3 as follows:

3. Individual units set in bay curtain wall construction.

and paragraph 1.03 RELATED WORK SPECIFIED ELSEWHERE, add new subparagraph B as follows:

B. ALUMINUM DOORS AND FRAMES: Bay curtain wall frames.

and page 4, paragraph 2.04 WINDOW TYPES (OPERATION), delete subparagraph A and substitute new paragraph as follows:

A. Single-Hung Windows: Units containing one balanced vertically-sliding sash requiring a pair of counterbalancing mechanisms complying with AAMA 902 "Sash Balance Specifications"and one or more fixed sash with a pair of lift handles on lower rail of sliding sash and latches at meeting rails to lock sash in closed position.
   1. Provide units which have "tilt-in" feature on sliding sash permitting both sides to be cleaned from interior.

ITEM NO. 11: DIVISION 8, SECTION 08800 GLASS AND GLAZING:
Page 1, pargraph 1.02 DESCRIPTION OF WORK, subparagraph B, add new article 4 as follows:

4. Repair of existing skylight.

ITEM NO 12: DIVISION 9, SECTION 09250 GYPSUM DRYWALL:
Page 1, paragraph 1.02 DESCRIPTION OF WORK, add new subpargraph C as follows:

C. Metal access panels where required for access to mechanical controls are included as work of this section.

and page 4, add new paragraph 2.07 as follows:

2.07 ACCESS PANELS:

A. Fabricate frames of continuous weled 16 gage steel construction. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners required.
   1. Fabricate with exposed flange 1" wide around perimeter of frame.

B. Fabricate doors of 14 gage flush panel steel with concealed spring hinges.
   1. For fire-rated units provide insulated doors, continuous piano hinge and self-closing mechanism.

C. Finish with manufacturer's factory applied primer paint.

D. Furnish with flush, screw-driver operated can locks as required to hold door flush when closed.

and page 8, add new paragraph 3.08 as follows:

3.08 INSTALLATION OF ACCESS PANELS: Comply with manufacturer's instructions. Coordinate with installation of gypsum drywall. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.

ITEM NO. 13: DIVISION 9, SECTION 09900 PAINTING:
Page 7, paragraph 2.04 INTERIOR PAINT SCHEDULE, delete subparagraph J and substitute the following:

J. Stained Woodwork: Stained-Varnish Finish: 3 finish coats over stain plus filler on open grain wood.
   1. Stain Coat: Interior Oil Stain (FS TT-S-711).
      a. Glidden: Y-201 Line-Ultra Hide Interior Stain.
      b. Moore: Benwood Interior Stain.
      xc.S-W: S-W Oil Stain.
   2. Filler Coat: As specified for natural finish woodwork.
   3. First Coat: As specified for natural finish woodwork.
   4. Second and Third Coats: As specified for natural finish woodwork.

ITEM NO. 14: DIVISION 10, SECTION 10050 PREFABRICATED SPECIALTIES:
Page 1, paragraph 1.02 DESCRIPTION OF WORK, subparagraph B, add new articles 5 and 6 as follows:

5. Rolling grilles.
6. Metal siding.

and page 2, paragraph 2.01 EXTRUDED ALUMINUM LOUVERS, delete subparagraph H and substitute the following:

H. Finish: Baked enamel finish AA-C12C42R1x; thermosetting modified acrylic enamel primer/topcoat system complying with AAMA 603.8 except with minimum dry film thickness of 1.5 mils, medium gloss; custom color as selected by Architect.

and page 3 add new paragraphs 2.05 and 2.06 as follows:

2.05 ROLLING GRILLES:

A. Fabricated of a network of 5/16" minimum diameter horizontal rods spaced approximately 2" o.c., interconnected by vertical links approximately 5/8" wide, spaced approximately 9" apart and rotating on the rods.
   1. Steel: Hot dip or electro galvanized and phosphatized before fabrication. Finish with manufacturer's standard rust inhibitive primer.
   2. Bottom Bar: Manufacturer's standard extruded shape or two angles, finished to match grille. Provide replaceable flexible vinyl or neoprene continuous floor bumper at underside of bar.
   3. End Locks: Continuous end links or other devices at end of rods, locking and retaining grille curtain in guides against excessive pressures, maintaining curtain alignment and preventing lateral movement.
   4. Guides: Manufacturer's standard extruded aluminum shape having curtain groove with return lips or bars to retain curtain. Furnish pile strips, rigid vinyl liner or other nonmetallic inserts to prevent metal to metal contact and minimize noise of travel. Furnish rvmovable stops on guides to prevent overtravel of curtain.

B. Counterbalancing Mechanism: Steel helical torsion spring, mounted around a steel shaft and contained in a spring barrel, connected to curtain. Use grease-sealed ball bearings on self-lubricatinggraphite bearings for rotating members.
   1. Counterbalance: Hot-formed structural quality carbon steel, welded or seamless pipe, of sufficient diameter and wall thicknees to support the roll-up curtain without distortion and limit barrel deflection to not more than 0.03" per foot of span under full load.
      a. Furnish spring balance of one or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Provide cast steel barrel plugs to secure ends of springs to barrel and shaft.

   b. Fabricate torsion rod for counterbalance shaft of case-hardened steel, sized to hold fixed spring ends and carry torsional load.
2. Brackets: Manufacturer's standard design, either cast iron or cold-rolled steel plate.
3. Hood: Form to entirely enclose coiled curtain and operating mechanism at openin head. Contour to suit end of barackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods and any portion of between jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sag.
   a. Fabricate hoods of not less than 24 gage hot-dip galvanized steel sheet complying with ASTM A 446, Grade A, with ASTM A 525, G90 zinc coating, mill phosphatized.

C. MOTOR OPERATION: Electric operator assembly of size and capacity recommended by grille manufacturer; complete with motor and factory prewired controls, gear reduction unit, solenoid operated brake, remote control stations and control devices.
1. Provide hand-operated disconnect or mechanism for automatically engaging a sprocket and chain operator and releasing brake for emergency manual operation. Mount disconnect and operator so they are accessible from floor level. Include an interlock device to automaticalluy prevent motor from operating when emergency operator is engaged.
   a. Design operator so that motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.
2. Operator Type: Wall or bracket-mounted operator units consisting of electric motor, worm gear drive from motor to reduction gear box, chain or worm gear drive from reduction box to a gear wheel mounted on counterbalance shaft, and disconnect-release for manual operation. Provide motor and drive assembly of horsepower and design as determined by manufacturer for size of unit required.
3. Electric Motors: High-starting torque, reversible, constant duty, Class A insulated electric motors with overlaod protection, sized to move grille in either direction from any position, at not less than 2/3' nor more than 1' per second.
   a. Coordinate wiring requirements and current characteristics of motors with building electrical system.
4. Remote Control Stations: Provide card controlled exterior units, full-guarded, standard duty, surface-mounted, weatherproof NEMA Type 4 enclosure.

5. Automatic Reverse Control: Automatic safety switch, extending full width of bottom and located within neoprene or rubber astragal mounted to bottom rail. Contact with switch before fully closing will immediately stop downward travel and reverse direction to fully opened position Connect to control circuit through retracting safety cord and reel or self-coiling cable.

D. Manufacturers: Subject to compliance with requirements, provide products of one of the following:
   1. Atlas Door Corp.
   2. Kinnear Div., Harsco Corp.
   3. J.G. Wilson Corp.

2.06 METAL SIDING:

A. Fabricated of aluminum sheet, ASTM B 209, alloy, temper and mill finish as recommended by manufacturer.

B. Finish: Factory applied baked-on enamel coating, consisting of epoxy primer and acrylic enamel topcoat with dry film thickness of not less than 0.2 mil for primer and 0.8 mil for topcoat.
   1. Color as selected by Architect from manufacturer's full range of colors available.

C. Accessories: Provide components required for a complete siding system, including trim, corner units, clips, seam covers, flashings, sealants, closure strips and similar items.
   1. Provide clip anchoring system with concealed fasteners.

D. Panel Perfomance: Fabricate and finish at factory by manufacturer's standard procedures and processes to fulfill indicated requirements which have been demonstrated by factory testing. Comply with indicated profiles, dimensional and structural requirements.
   1. Metal Gages: Not less than manufacturer's recommended minimums for profiles and application indicated; not less than 22 gage.
   2. Required Performances: As installed.
      a. Wall Loading: 20 lbs. psf inward; 15 lbs. psf outward.
      b. Water Penetration: No significant, uncontrolled leakage at 4 lbs. psf pressure with spray test.
      c. Air Infiltration:0.02 cfm psf for gross wall area, with 4 lbs. psf differential pressure.
   3. Fabricate panel joints with captive gaskets or separator strips which provide a tight seal and prevent metal to metal contact in a manner to minimize noise from movements iwthin panel system.
   4. Condensation: Fabricate panels for control of condensation, including vapor inclusion of seals and provisions for breathing, venting, weeping and draining.

E. Installation Tolerances: Shim and align panel units within installed tolerance of 1/4" in 20'-0" on level/plumb/slope and location/line as indicated and within 1/8" offset of adjoining faces and alignment of matching profiles.

F. Joint Sealers: Install gaskets, joint fillers and sealants as required for weatherproof performance of panel system. Provide types recommended by panel manufacturer.

END OF ADDENDUM

ATTACHMENTS: SECTION 07110 SHEET MEMBRANE WATERPROOFING

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of sheet membrane waterproofing is indicated on drawings.
  1. Under concrete slabs where indicated.
B. Type of sheet waterproofing specified is EPDM membrane.

1.03 SYSTEM PERFORMANCE: Provide sheet waterproofing products that have been produced and installed to establish and maintain watertight continuous seals.

1.04 SUBMITTALS: Submit the following in accordance with Conditons of Contract and Division 1 General Requirements.

A. Product data and general recommendations from waterproofing materials manufacturer for types of waterproofing required.
B. Samples of sheet membrane and auxiliary materials as requested by Architect.

1.05 QUALITY ASSURANCE:

A. Manufacturer: Obtain primary waterproofing materials of type required from a single manufacturer. Provide secondary materials only as recommended by manufacturer of primary materials.
B. Installer: Firm with not less than 5 waterproofing projects similar to requirements for this project with satisfactory service performance.
C. Preinstallation Conference: Prior to installation of waterproofing and associated work, meet at project site with installers of work requiring coordination with waterproofing work and inspection/testing agency representatives. Review material selections and procedures to be followed in performing work. Notify Architect 48 hours before conducting meeting.

1.06 PROJECT CONDITIONS:

A. Substrate: Proceed with work after substrate construction, openings, and penetrating work have been completed.
B. Weather: Proceed with waterproofing work only when existing and forcasted weather conditions will permit work to be performed in accordance with manufacturer's recommendations and warranty requirements.

1.07 WARRANTY: Submit written warranty, executed by manufacturer, agreeing to repair or replace sheet membrane waterproofing that fails in materials or workmanship within 5 years after date of substantial completion. This warranty shall be in addition to and not a limitation of other rights Owner may have against Contractor under Contract Documents.

PART 2 PRODUCTS

2.01 EPDM SHEET WATERPROOFING: Ethylene propylene diene monomers formed into uniform flexible sheets of thickness shown or, if no thickness is shown not less than 1/16" thick, complying with following:

A. Hardness: 50 to 70 Shore A; ASTM D 2240.
B. Tensile Strength: 1400 psi; ASTM D 412.
C. Ultimate Elongation: 300 percent; ASTM D 412.
D. Brittleness Temperature: Minus 75 degree F.; ASTM D 746.
E. Tear Resistance: 125 lbs. per lin. inch; ASTM D 624 (Die C).
F. Resistance to Heat Aging: Maximum hardness increase of 15 points, maximum reduction in elongation of 30 percent and maximum loss of tensile strength of 15 percent (168 hrs. at 240 degree F.); ASTM D 1149.
G. Resistance to Ozone Aging: No cracks after 168 hours exposure of 50 percent elongated sample at 104 degrees F. and 100 pphm ozone; ASTM D 1149.
H. Resistance to Water Absorption: Less than 0.5 percent volume gain for 72 hours immersion at 212 degrees F; ASTM D 471.
J. Products: Subject to compliance with requirements, provide one of the following:
    1. Hydro-Seal EPDM; American Hydrotech, Inc.
    2. Sure-Seal EPDM; Carlise Syntec Systems.

2.02 AUXILIARY MATERIALS:

A. Adhesives and Joint Tape: Types recommended by waterproofing sheet manufacturer for bonding to substrate (if required), for waterproofng sealing of seams in membrane and for waterproof sealing of joints between membrane and flashings, adjoining surfaces and projections through membrane.
B. Primers: Type recommended by manufacturer of sheet waterproofing material for applications indicated.
C. Flashing Materials: Types recommended by sheet waterproofing manufacturer for applications indicated.
D. Protection Board: Type recommended by sheet waterproofing manufacturer. Include recommended adhesives.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which sheet membrane waterproofing work is to be performed. Do not proceed with work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 PREPARATION:

A. General: Comply with manufacturer's instructions for surface preparation.
B. On concrete decks immediately before placement of waterproofing sheet, grind or abrasive-blast surface lightly to ensure removal of projections that might penetrate sheet or curing compounds that would interfere with bonding.
C. One vertical foundation walls chip off projections where necessary for proper placement and adhesion of waterproofing sheet.
D. Apply primer to concrete and masonry surfaces at rate recommended by manufacturer of sheet waterproofing. Prime only area that will be covered by membrane in same working day; reprime areas not covered within 24 hours.

3.03 INSTALLATION:

A. Comply with manufacturer's instructions for handling and installation of sheet waterproofing materials.
B. Coordinate installation of waterproofing materials and associated work to provide complete system complying with combined recommendations of manufacturers and installers involved in work. Schedule installation to minimize period of exposure of sheet waterproofing materials.
   1. Seal to projections through membrane and seal seams. Bond to vertical surfaces; horizontal surfaces where recommended by manufacturer.
C. Top Edge Seal: For vertical and sloped wall membrane, finish in reglet where provided; otherwise finish under flashing or masonry joint. Seal exposed edges with mastic or sealant.
D. Expansion Joints: Install joint filler as recommended by manufacturer with protruding rounded surface. Apply continuous 8 inch wide strip of membrane on joint, followed by membrane application.
D. Coat exposed areas of sheet and flashing materials. Comply with sheet manufacturer's recommendations for application and cure of coating.
E. Install protection board over completed membrane, complying with manufacturer's recommendations for both waterproofing sheet and protection course materials.

3.04 FIELD QUALITY CONTROL: Before completed membranes on horizontal surfaces are covered by protection course or other work, test for leaks with 2 inch depth of water maintained for 24 hours. Repair any leaks revealed by examination of substructure and repeat test until no leakage is observed.

3.05 PROTECTION: Provide protection for completed membrane during installation of other materials or processes over membrane and throughout remainder of construction period. Do not allow traffic of any type on unprotected membrane.

END OF SECTION

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LATEST ADDENDUM GOVERNS WHERE CONFLICT OCCURS WITH PREVIOUSLY ISSUED MODIFICATIONS.

ACKNOWLEDGE THE NUMBER OF THIS ADDENDUM ON PROPOSAL AND CONTRACT FORMS.

CHANGES TO BIDDING DOCUMENTS:

ITEM NO. 1: MEMO TO GENERAL CONTRACTORS, DEC. 8 :
Page 1 ,last paragraph, add as follows:

> Winter conditions are part of the one-year period of the Contract.

CHANGES TO CONTRACT DOCUMENTS:

ITEM NO: 2: OWNER-CONTRACTOR AGREEMENT
Page 1, paragraph 2, add as follows:

> Winter conditions are part of the one-year period of the Contract.

ITEM NO. 3: Page 2, paragraph 3., Adjustment to Contract Sum, amend as follows:

> Alternate No.1. Plumbing and Fire Protection .
> (Other Alternates to be added as proposed by each General Contractor.)

ITEM NO. 4: Add the document titled NON-DISCRIMINATION IN EMPLOYMENT as attached at the end of this addendum.

CHANGES TO SPECIFICATIONS :

ITEM NO. 5: DIVISION 1
Add new SECTION 01025 ALTERNATES AND ALLOWANCES as attached at the end of this addendum.

ITEM NO. 6: DIVISION 7
Add new SECTION 07250 SPRAYED-ON FIREPROOFING as attached at the end of this addendum.

ITEM NO. 7: DIVISION 8, SECTION 08520 ALUMINUM WINDOWS paragraph 2.03 WINDOW CLASSIFICATION (GRADE) add the following sentence:

For Building Z provide heavy duty commercial windows.

ITEM NO. 8: DIVISION 9, SECTION 09900 PAINTING paragraph 1.02 B, add in item 2 to follow item 1 as follows:

Painting of site stairs, fences, railings and gates is included in this section.

ITEM NO. 9: DIVISION 5, SECTION 05500 METAL FABRICATIONS praragraph 1.02 C DESCRIPTION OF WORK, add item 8 to follow item 7.

8. Metal site fencing railings and gates.

ITEM NO. 10: DIVISION 5, SECTION 05500 METAL FABRICATIONS paragraph 2.07, change title of paragraph to read:

2.07 STEEL RAILINGS, HANDRAILS, SITE FENCING AND GATES:

Paragraph 2.07 A, change first sentence to read:

Fabricate railings, handrails, site fencing and gates to design.....

CHANGES TO DRAWINGS:

ITEM NO. 10 DRAWING D-1, Add the following to the Demolition Notes:

At Building Z remove metal cladding on rear exterior
of the building.

ITEM NO. 11: DRAWING A-17, A-18, A-19 & A-20 , provide sprayed-on fireproofing at all colunms and beams.

ITEM NO. 12: DRAWING A-17 & A-18, Change note "...1/2" CDX sheathing " to "...Gypsum sheathing board."

ITEM NO. 13: DRAWING A-25 At Kitchen Type 1, provide half wall behind range counter. Wall to be constructed of 3 5/8" metal studs with 5/8" drywall. At top of wall provide wood cap. Height of wall to match height of range back display panel. Cabinets above to be backed with laminate faced particle board or approved substitution. Does not include kichens in Units # 27, 28, 29 .

ITEM NO. 14: DRAWING A-33 & A-34 - Delete reference to gauge of site fence, pickets and frames. Items to be bar stock. Fence and railings to be finished per specification.

ITEM NO. 15: DRAWING H-1 & H-6 Add note as follows: All hot water supply and return risers require shut-off valves at junction with main pipe loops (typical).

ITEM NO. 16: DRAWING H-5 Add note as follows : All dryer ventilators will require 12" high prefabricated roof curbs. All prefabricated roof curbs require proper flashing.

ITEM NO.17: DRAWING H-12 Substitute Valve # 013G8015 Operator 013G8200 for Valve # 13-7011

ITEM NO. 18: DRAWING E-3 Note 1-a Amend as follows: Provide (30) Thirty... Note 2-a Amend as follows : Provide (36) Thirty-six...

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of sprayed-on fireproofing is indicated on drawings and by provisions of this section.

B. Type of fireproofing included: Mineral Fiber.

1.03 QUALITY ASSURANCE:

A. Single Source responsibility: Obtain sprayed-on fireproofing materials from a single manufacturer.

B. Fire Performance Characteristics: Provide materials and construction which are identical to those tested for the following fire performance characteristics, according to test method indicated, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire Resistance Ratings: As indicated by reference to design designation in UL "Fire Resistance Directory" for fire-rated assemblies in which sprayed-on fireproofing serves as direct applied protection, tested per ASTM E 119.
2. Surface Burning Characteristics: As indicated for each sprayed-on fireproofing product required, tested per ASTM E 84 and listed in UL "Building Materials Directory".

C. Maximum Allowable Asbestos Content: Where sprayed-on fireproofing is composed of lightweight mineral aggregates or mineral fibers, provide products which contain less than 0.25% by weight of asbestos of any type or mixture of types occurring naturally as impurities, as determined by polarized light microscopy test per Appendix A of 40 CFR 763.

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's product data for each sprayed-on fireproofing product indicated.

B. Test Reports: Submit the following test reports:

1. Certified test results from an independent testing laboratory indicating compliance of sprayed-on fireproofing products with performance requirements indicated, including asbestos content.
2. Test results of in-place performance as required under Part 3 of this section for field quality control.

C. Certificates: Submit the following certificates:

1. Where primers are applied to steel in shop or field, submit statement from primer manufacturers, certifying that primers are compatible with sprayed-on fireproofing and will not impair its performance under fire exposure for applications indicated, as proved by ASTM E 119 test. Include test and other data as evidence; distribute data to sprayed-on fireproofing manufacturer.
2. Acceptance of steel primers by sprayed-on fireproofing manufacturer, based on data submitted by primer manufacturer.
3. Sprayed-on fireproofing manufacturers' certification that their products comply with specification requirements and are suitable for the use indicated.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Deliver products to project site in original, unopened packages with manufacturers' labels identifying products legible and intact. Include on labels names of products and manufacturers, date of manufacture and shelf life, where applicable. Also include UL labels for fire-resistance ratings applicable to project.

B. Use materials with limited shelf life within period indicated. Remove from project site and discard any materials whose shelf life has expired.

C. Store materials inside, under cover, above ground and in a manner to keep them dry until ready to use. Remove from project site and discard any materials that have been exposed to moisture or have otherwise deteriorated.

1.06 PROJECT CONDITIONS: Do not install sprayed-on fireproofing when ambient or substrate temperatures are 40 deg.F and falling, unless temporary protection and heat can be provided to maintain temperatures of both at or above this temperature level for 24 hours before, during and for 24 hours after application of sprayed fireproofing. Ventilate spray fireproofing by means of natural or, where this inadequate, of forced air circulation during an after application until it dries thoroughly.

1.07 SEQUENCING:

A. Sequence and coordinate application of sprayed-on fireproofing with other, related work specified in other sections to comply with following requirements:

1. Prevent deterioration of sprayed-fireproofing for interior applications due to exposure to unfavorable environmental conditions.
2. Avoid unnecessary exposure of sprayed-on fireproofing to abrasion and other damage likely to occur during construction operations subsequent to its application.

3. Ensure that sprayed-fireproofing is installed prior to installation of enclosing or concealing work, with sufficient time allowed for inspection, testing and correction of defective fireproofing.

PART 2 PRODUCTS

2.01 FIREPROOFING MATERIALS:

A. Mineral Fiber Fireproofing: Factory-mixed dry formulation of inorganic binders, mineral fibers, fillers and additives for sprayed-on application by conveying dry mixture by low pressure air through hose and mixing it with water at spray nozzle.

1. Physical Properties: Minimum values measured per standard test methods referenced with each property, as follows:
    a. Bond Strength: 80 lbf. per sq. ft. per ASTM E 736.
    b. Compressive Strength: 3.47 lbf. per sq. in. per ASTM E 761.
    c. Corrosion Resistance: No evidence of corrosion per ASTM E 937.
    d. Deflection: No cracking, spalling, delamination or the like per ASTM E 759.
    e. Effect of Impact on Bonding: No cracking, spalling, delamination or the like per ASTM E 760.
    f. Air Erosion: Maximum weight loss of 0.025 grams per sq. ft. per ASTM E 859.
    g. Dry Density: Values for average and individual densities as required for fire-resistance ratings indicated, per ASTM E 605.
    h. Hardness: 0.50" max. penetration per ASTM C 569.
    j. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 10 and 0, respectively.

B. Products: Subject to compliance with requirements, provide one of the following:

1. "SprayDon Standard J", American Energy Products Corp.
2. "Cafco Blaze-Shield"; United States Mineral Products Co.
3. "Cafco Deck-Shield"; United States Mineral Products Co.

2.02 AUXILIARY FIREPROOFING MATERIALS:

A. General: Provide auxiliary fireproofing materials which are compatible with sprayed-on fireproofing products and substrates, approved for use indicated by manufacturers of sprayed-on fireproofing, and which have been approved by UL or other acceptable testing and inspecting agency for use in fire-resistance rated designs indicated.

B. Substrate Primers: Type approved by manufacturer of sprayed-on fireproofing for substrate and for conditions of exposure indicated.

C. Adhesive for Bonding Fireproofing: Type recommended by manufacturer of sprayed-on fireproofing manufacturer.

PART 3 EXECUTION

3.01 INSPECTION:

A. Examine substrates to determine if they are in satisfactory condition to receive sprayed-on fireproofing. A satisfactory substrate is defined as follows:

1. Substrate complies with requirements of the section in which the substrate and related work is specified and is free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt or other foreign substances capable of impairing bond of fireproofing with substrate under conditions of normal use or fire exposure.
2. Objects which will penetrate fireproofing, including clips, hangers, support sleeves and similar items have been securely attached to substrates.
3. Substrates are not obstructed by ducts, piping, equipment and other suspended construction that could interfere with application of fireproofing.

B. For steel or other substrates suspected of being coated with oil, rolling compounds or other substances not readily identifiable but potentially capable of impairing bond, conduct tests recommended by fireproofing manufacturer to determine their presence and effect on adhesion of fireproofing.

C. Do not proceed with installation of fireproofing until unsatisfactory conditions have been corrected.

3.02 PREPARATION:

A. Clean substrates of substances which could impair bond of fireproofing, including oil, grease, rolling compounds, incompatible primers, and loose mill scale.

B. Prime substrates where recommended by fireproofing manufacturer, except where compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.

C. Cover other work which might be damaged by fall-out or overspray of fireproofing materials during application. Provide temporary enclosure as required to confine spraying operations, protect the environment, and to ensure adequate ambient conditions for temperature and ventilation.

3.03 INSTALLATION:

A. General: Comply with fireproofing manufacturer's instructions for mixing materials, for application procedures and for types of equipment used to convey and spray-on fireproofing materials; as applicable to the particular conditions of installation and as required to achieve fire-resistance ratings indicated.

B. Coat substrates with adhesive prior to application of fireproofing where required to achieve fire-resistance rating or recommended by fireproofing manufacturer for material and application indicated.

C. Extend fireproofing full thickness over entire area of each substrate to be protected. Unless otherwise recommended by fireproofing manufacturer, install body of fireproof covering in a single course.

D. Apply fireproofing in thicknesses and densities indicated but not less than that required to achieve fire resistance ratings designated for each condition, unless greater thicknesses and densities are indicated.

E. Apply fireproofing materials by sprayed-on method to maximum extent possible. Following spraying operation in each area, complete the coverage by trowel application or other placement method acceptable to manufacturer.

3.04 FIELD QUALITY CONTROL:

A. Testing Laboratory: Contractor shall employ and pay an independent testing laboratory experienced in the testing of sprayed-on fireproofing and acceptable to Architect, to perform field quality control testing.

B. Extent and Testing Methodology: Arrange for testing of completed fireproofing in successive stages in areas of extent described below; do not proceed with fireproofing of next area until test results for previously completed work evidence compliance with requirements.

1. Extent of Each Test Area: Not greater than one floor or 10,000 sq. ft., whichever produces the greatest number of test areas.
2. Within each area, testing laboratory shall randomly select a typical bay, and test each fireproofed structural element within it for thickness and density per ASTM E 605.
3. Within each area, testing laboratory shall randomly select one typical structural element of each type and test fireproofing for cohesion/adhesion per ASTM E 736.

C. Testing Laboratory shall report test results promptly and in writing to Contractor and Architect.

D. Repair or replace fireproofing within areas where test results indicate fireproofing does not comply with requirements.

3.05 CLEANING, REPAIR AND PROTECTION:

A. Cleaning: Immediately upon completion of spraying operations in each containable area of project, remove over-spray and fall-out of materials from surfaces of other work and clean exposed surfaces to remove evidence of soiling.

B. Protect fireproofing according to advice of fireproofing manufacturer and Installer form damage resulting from construction operations or other causes so that fireproofing will be without damage or deterioration at time of substantial completion.

C. Coordinate installation of fireproofing with other work in order to minimize the need for other trades to cut or remove fireproofing. As other trades successively complete installation of their work, maintain protection of structure afforded by fireproofing by patching any areas which have been removed or damaged prior to concealment of fireproofing by other work.

D. Repair or replace work which has not been successfully protected.

END OF SECTION

THE FOLLOWING REVISIONS AND ADDITIONS ARE TO BE INCORPORATED INTO THE ROXBURY CORNERS HOUSING, BOSTON, MASSACHUSETTS DOCUMENTS DATED 8 DECEMBER 1989 AND PREPARED BY CPF/ DOMENECH AND HICKS, ARCHITECTS INC., BOSTON, MASSACHUSETTS AND BECOME A PART OF THE DOCUMENTS ON THIS DATE 22 DECEMBER 1989. THEY ARE AS BINDING AS IF INSERTED IN ENTIRETY IN LOCATIONS DESIGNATED.

LATEST ADDENDUM GOVERNS WHERE CONFLICT OCCURS WITH PREVIOUSLY ISSUED MODIFICATIONS.

ACKNOWLEDGE THE NUMBER OF THIS ADDENDUM ON PROPOSAL AND CONTRACT FORMS.

CHANGES TO SPECIFICATIONS :

ITEM NO. 1: DIVISION 2 SECTION 02500 PAVING AND CURBING page 5, change titles of paragraphs 3.04, 3.05 and 3.07 to read:

3.04 FORM CONSTRUCTION FOR CONCRETE PAVING AND CURBING:

3.05 REINFORCEMENT FOR CONCRETE PAVING AND CURBING:

3.07 JOINTS FOR CONCRETE PAVING AND CURBING:

ITEM NO. 2: DIVISION 2 SECTION 02900 LANDSCAPE WORK page 4, delete paragraph 2.01 TOPSOIL: and insert the following

2.01 SCREENED TOPSOIL:

A. Topsoil shall be a "fine sandy loam" or a "sandy loam" determined by mechanical analysis and based on the "U.S.D.A classification system". Topsoil shall contain 70-50% sand by weight. It shall be of uniform composition, without admixture of subsoil. It shall be screened and free of stones greater than one inch, lumps, plants and their roots, debris and other extraneous matter over one inch in diameter or excess quantities of smaller pieces of the same materials as determined by the Landascape Architect. It shall not contain toxic substances harmful to plant growth. It shall be obtained from areas which have never been stripped before and have a history of satisfactory vegetative growth.

B. Topsoil shall not have an acidity in excess of pH 7.0 and shall contain not less than 4% nor more than 20% organic matter as determined by the loss of ignition of oven-dried samples. Test samples shall be oven-dried to a constant weight at a temperature of +230° F., plus or minus 9° F.

C. The Contractor shall submit soil test results and sample to Architect for approval.

D. No topsoil shall be delivered in a frozen or muddy condition.

and page 6 paragraph 3.02 PREPARATION subparagraph A delete item 4 and substitute the following:

4. All shrub, ground cover, vine and tree plantings shall be installed in beds having a minimum of 18" of prepared planting mix throughout planting bed.

and page 6 paragraph 3.02 PREPARATION subparagraph B Item 1a .,shall be changed to read as follows:

a. Spread top soil mixture to minimum compacted depth of eighteen (18) inches to meet...

and page 9, paragraph 3.08 SCHEDULE OF PLANTING SOIL MIXTURE REQUIREMENTS: delete subparagraph A and insert the following:

A. Planting mixture for planting backfill in all planted areas shall be prepared on site in the following proportions:

3 parts loam
1 part peat moss
1 part composted cow manure

1. All amendments shall be thoroughly incorporated into the loam to assure even distribution.
2. Planting mixture shall have fertilizer incorporated in accordance with laboratory test recommendations. Amendment rate will be 6 times square foot application rate per cubic yard of loam as directed by Landscape Architect.

ITEM NO. 3: DIVISION 7 SECTION 07500 FLEXIBLE SHEET ROOFING page 1 paragraph 1.02 DESCRIPTION OF WORK, subparagraph B., substitute item 1. with :

1. Loosely laid and ballasted system.

and paragraph 1.03 RELATED WORK SPECIFIED ELSEWHERE subparagraph A, add the following: Skylights.

and page 2 paragraph 1.05 SUBMITTALS subparagraph B., add the following :

3lb. bag aggregate surfacing and 2 sq. ft. precast concrete pavers .

and page 3 paragraph 2.02, delete the words:

ADHERED SYSTEM

substitute with:

SHEET ROOFING

and at same paragraph 2.02, subparagraph A, substitute with the following:

Elastomeric sheet material, 1400 psi minimum tensile strength (ASTM D 412) 300% elongation (ASTM D 412), vapor permeable, ultraviolet and ozone resistant, low temperature brittleness of 75 degrees F (ASTM D 746), standard color.

1. Thickness: 45 mils, nominal.
2. UL Firerated.

and paragraph 2.03 AUXILLIARY MATERIALS delete subparagraph F., add the following:

F. Aggregate Surface Ballast: Washead, rounded river bed gravel or other acceptable smooth-faced stone ranging in size from 1" to 2" in diameter, which will withstand weather exposure without significant deterioration.

G. Concrete Paver Ballast: Prefabricated concrete pavers designed specifically for ballasting sheet roofing membranes. Provide interlocking units with subsurface drainage channels, weighing approximately 12 psf with minimum 2500 psi compressive strength.

H. Walkway Protection : Sheet roofing manufacturer's standard rubber walkway pads for traffic areas, standard size and color.

and page 4 paragraph 2.05 AUXILLIARY INSULATION MATERIALS: Add the following:

B. Fiber Mesh: Polyester woven recommended by sheet roofing manufacturer for application over roof insulation to secure it in place.

and page 4 paragraph 3.03 INSTALLATION: subparagraph C. Flexible Sheet Roofing, substitute item 3. with the following:

3. Loose-Laid Ballasted System: Install membrane by unrolling over prepared substrate , fastening at perimeter and at roof penetrations. Lap adjoining sheets and bond, covering top edges of each sheet at seams with uniform fillet of sealant as recommended by manufacturer. Install flashings and counter flashing as indicated and as recommended by sheet roofing manufacturer.
Apply aggregate ballast in uniform thickness at rate of 10 to 12 lbs. per square foot, spreading with care to minimize possibility of damage to membrane; apply in conformance with FM Technical Bulletin I-29.
Apply paver ballast in accordance with manufacturer's instructions, interlocking adjacent units and securing perimeter against removal. Provide layer of protection board under pavers where recommended by sheet manufacturer.

ITEM NO. 4 SECTION 07900 JOINT SEALANTS page 1, paragraph 1.02 DESCRIPTION OF WORK, add the following:

5. Expansion joints.

and page 5 add the following paragraph:

2.06 EXPANSION JOINTS :

1. Impregnated preformed expanding foam sealant type, open cell high density polyurethane foam, density 9-10 lb/ft., tensile strength 21 PSI, ultimate elongation 150%.
2. Emseal Color-seal by Emseal Joint Systems Ltd. or approved equal.

ITEM NO. 5: DIVISION 10 SECTION 10050 PREFABRICATED SPECIALTIES page 1 paragraph 1.02 DESCRIPTION OF WORK item B., add the following:

5. Expansion joint cover plates.

and page 3 add the following paragraph:

2.05 EXPANSION JOINT COVER PLATES: Metal cover plate as manufactured by Construction Specialties Inc.

THE FOLLOWING REVISIONS AND ADDITIONS ARE TO BE INCORPORATED INTO THE Roxbury Corners Housing, Boston, Massachusetts DOCUMENTS DATED 22 DECEMBER 1989 AND PREPARED BY CPF/Domenech And Hicks, Architects Inc., AND BECOME A PART OF THE DOCUMENTS ON THIS DATE February 16, 1990. THEY ARE AS BINDING AS IF INSERTED IN ENTIRETY IN LOCATIONS DESIGNATED.

LATEST ADDENDUM GOVERNS WHERE CONFLICT OCCURS WITH PREVIOUSLY ISSUED MODIFICATIONS.

ACKNOWLEDGE THE NUMBER OF THIS ADDENDUM ON PROPOSAL AND CONTRACT FORMS.

CHANGES TO SPECIFICATIONS :

ITEM NO. 1: TABLE OF CONTENTS: Add SECTION 07110 SHEET WATERPROOFING, 4 pages (ADDENDUM NO. 1) and SECTION 09200 LATH AND PLASTER. - 8 pages (ADDENDUM NO. 4).

ITEM NO. 2: INVITATION LETTER TO GENERAL CONTRACTOR dated 12/8/89 from United South End Lower Roxbury UDC, FOUND IN SPECIFICATIONS, Change paragraph 5 on page 1 of letter to read as follows:

The Commercial tenants are anticipated to be relocated from the Parcel SE70-71 Site no later than April 30, 1990.

ITEM NO. 3: DIVISION 2, SECTION 02050 SELECTIVE DEMOLITION: Page 3, paragraph 3.03 DEMOLITION, add new subparagraph C as follows:

C. Remove lead paint from existing surfaces to remain and dispose of residue in a manner to comply with local and federal authorities having jurisdiction. Protect public and personnel from contamination.

ITEM NO. 4: DIVISION 2, SECTION 02200 EARTHWORK, page 4, subparagraph 1.06 PROTECTION paragraph B, article 4, delete last sentence in article 4.

ITEM NO. 5: DIVISION 2, SECTION 02200 EARTH WORK: Page 7, change paragraph number 2.03 to 2.04. Insert new paragraph 2.03 to read as follows:

2.03 STONE DUST

A. Stone dust shall consist of inert materials that are hard, durable stone free from surface coatings and deleterious materials. Submit sample for BHA Representative's approval. Gradation requirements shall be as follows:

Sieve	Percentage Passing By Weight
#1	100
#8	80 - 90
#16	50 - 80
#30	30 - 60
#50	20 - 45
#100	10 - 25
#200	4 - 12

ITEM NO. 6: DIVISION 2, SECTION 02200 EARTHWORK Page 8, paragraph 3.02 EXCAVATION, subparagraph C, article 2, change to read as follows:

2. Removal of contaminated soils and its replacement as directed will be paid on basis of contract conditions relative to changes in work.

ITEM NO. 7: DIVISION 2, SECTION 02800 SITE IMPROVEMENTS: Page 1, paragraph 2.01 CONCRETE RETAINING WALLS, change 3500 psi to 4000 psi.

ITEM NO. 8: DIVISION 2, SECTION 02900 LANDSCAPE WORK: Page 7, paragraph 3.02 PREPARATION subparagraph G, delete articles 1-3 and insert new articles 1-4 as follows:

G. Excavation for Trees and Shrubs:

1. All plant pits shall be excavated with vertical sides.
2. Tree pits shall be four feet (4') greater in diameter than the ball of earth or spread of roots of the tree. Tree pits shall be 12" deep or the depth of the rootball, whichever is greater.
3. Furnish and install all planting mixture required for tree pits.
4. Shrub beds shall be excavated 18" deep conforming to shape on plans as approved in

field by Landscape Architect. Backfill shrub bed with planting mixture.

ITEM NO. 9: DIVISION 4, SECTION 04500 MASONRY RESTORATION AND CLEANING: Page 1, paragraph 1.02 DESCRIPTION OF WORK, subparagraph B, article 2, delete item "a"; article 3, delete item "a"; delete article 4.

and page 3, paragraph 1.08 SEQUENCING/SCHEDULING, subparagraph A, delete article 5.

and page 5, paragraph 2.03 CLEANING MATERIALS AND EQUIPMENT, delete subparagraph F.

and page 8, paragraph 3.03 CLEANING EXISTING MASONRY, delete subparagraph E.

ITEM NO.10: DIVISION 5, SECTION 05500 METAL FABRICATIONS: Page 1, paragraph 1.02 DESCRIPTION OF WORK, subparagraph C, add new article 8 as follows:

8. Metal grating

and page 7, paragraph 2.09 STEEL FRAMED STAIRS, add new subparagraph E. as follows:

E. Floor Grating Treads and Platforms: Provide patterns, spacing and bar sizes indicated; fabricate to comply with NAAMM "Metal Bar Grating Manual".

1. Shop prime for painted finish.
2. Fabricate grating treads with steel plate nosing on one edge and with steel angle or steel plate carrier at each end for stringer connections. Secure treads to stringers with bolts.
3. Fabricate grating platforms with nosing matching that on grating treads, at all landings. Provide toe plates at open-sided edges of grating platform. Secure grating to platform frame with welds.

and add new paragraph 2.10 as follows:

2.10 METAL GRATING:

A. Heavy Duty Metal Bar Grating: Comply with "Guide Specifications for Heavy Duty Metal

Bar Grating" published in NAAMM "Heavy Duty Metal Bar Grating Manual.

B. Provide pressure-locked rectangular aluminum gratings designed to support 300 lb. per sq. ft. loading; include clips to anchor to substrate indicated.

ITEM NO.11: DIVISION 6, SECTION 06200 FINISH CARPENTRY: Page 3, paragraph 2.02 MATERIALS, subparagraph C, article 1, add new item "b":

b. Where indicated provide closed-grain hardwood of any species.

and article 3, add new item "a" as follows:

a. Where indicated provide closed-grain hardwood of any species.

and page 4, add new article 7 as follows:

7. Plywood: A/C INT APA plywood, with exterior glue, any softwood species: thickness indicated.

ITEM NO.12: DIVISION 7, SECTION 07110 SHEET WATERPROOFING: Page 1, paragraph 1.02 DESCRIPTION OF WORK, subparagraph A, add new articles 2 and 3 as follows:

2. On vertical surfaces where indicated.
3. Under tile pavers where indicated.

ITEM NO.13: DIVISION 7, SECTION 07200 INSULATION: Page 2. paragraph 2.01 MATERIALS, subparagraph A, delete word "Foundation" and add new article 4 as follows:

4. Minimum compressive strength of 40 psi for insulation under tile pavers.

ITEM NO.14: DIVISION 7, SECTION 07500 FLEXIBLE SHEET ROOFING: Addendum No. 3, page 2, ITEM NO. 3, paragraph 2.02, subparagraph A, add new article 3 as follows:

3. For adhered applications provide 60 mils, nominal thickness.

and paragraph 2.03 AUXILIARY MATERIALS, do not delete subparagraph F and re-alphabetize following paragraphs as G, H and J.

and paragraph 3.03 INSTALLATION, subparagraph C, do not delete article 3. Adhesive-Adhered Membrane and renumber new article Loose-Laid Ballasted System as paragraph 4.

and SECTION 07500, page 3, paragraph, 2.03 AUXILIARY MATERIALS, subparagraph B, after the words "Gravel Stops" add the work "Fascias" and add new article 2 as follows:

2. Provide sizes indicated.

and page 4, paragraph 2.04 INSULATION, add new subparagraph C as follows:

C. Extruded Polystyrene Board Insulation: Rigid, cellular thermal insulation with closed cells and integral high density skin, formed by expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578; with 5 year aged r-values of 5.4 and 5 at 40 and 75 degrees F., respectively; and as follows:
1. Minimum compressive strength of 40 psi for insulation under precast concrete pavers.
2. Maximum flame spread and smoke developed of 5 and 165. respectively.

ITEM NO.15: DIVISION 7, SECTION 07600 FLASHING AND SHEET METAL: Page 2, paragraph 2.02 FABRICATED UNITS, subparagraph B, article 1, item a, after words "finish in" insert word "custom" and after word "Architect" delete words "from manufacturer's standards".

ITEM NO.16: DIVISION 8, SECTION 08100 METAL DOORS AND FRAMES: Page 1, paragraph 1.05 SUBMITTALS, subparagraph B, after word "steel" insert words "doors and".

and article 1, after words "schedule of", insert words "doors and".

ITEM NO.17: DIVISION 8, SECTION 08200 WOOD DOORS: Page 2, paragraph 1.05 SUBMITTALS, add new subparagraph C as follows:

C. Provide schedule of door types using same reference numbers for details as those on contract drawings.

ITEM NO.18: DIVISION 8, SECTION 08520 ALUMINUM WINDOWS: Page 4, paragraph 2.06 FABRICATION AND ACCESSORIES, add new subparagraphs J and K as follows:

J. Metal Shapes: Where indicated, provide metal panning and special formed headers and sills adjacent to window frames of gage recommended by window manufacturer; fabricated to match window frames.

K. Metal Panels: Where indicated, provide flush-laminated metal panels between adjacent window frames; fabricated with rigid closed-cell urethane core laminated with waterproof glue between two sheets of aluminum; matching adjacent frames and secured with concealed fasteners.

ITEM NO.19: DIVISION 8, SECTION 08700 HARDWARE, page 4, change paragraph number 2.03 LOCKS AND CYLINDERS to number 2.04 LOCKS AND CYLINDERS.

ITEM NO.20: DIVISION 8, SECTION 08700 HARDWARE, page 5, paragraph 2.04 LOCKS AND CYLINDERS, subparagraph D delete articles 1,2 and 3. Insert new article 1 as follows:

1. Medeco

ITEM NO.21: DIVISION 8, SECTION 08700 HARDWARE, page 5, paragraph 2.03 LOCKS AND CYLINDERS, add subparagraph K after J as follows:

K. Use Medeco Key Control System Level 2 at all unit entrance and exit doors.

ITEM NO.22: DIVISION 8, SECTION 08800 GLASS AND GLAZING: Page 3, paragraph 2.03 FABRICATED GLASS UNITS, subparagraph A, article 1, add "Minimum thickness 3/16".

ITEM NO.23: DIVISION 9, Add new SECTION 09200 LATH AND PLASTER as attached at end of this addendum.

ITEM NO.24: DIVISION 9, SECTION 09250 GYPSUM DRYWALL: Page 2, paragraph 2.02 METAL SUPPORT MATERIALS, subparagraph B, delete article 5. Shaftwall Framing:

and page 3, paragraph 2.03 GYPSUM PRODUCTS, delete subparagraph D. Shaftwall Board.

and page 7, paragraph 3.03 INSTALLATION OF GYPSUM BOARD, subparagraph C, delete article 5. Drywall Shaft Systems.

ITEM NO.25: DIVISION 9, SECTION 09300 TILE: Page 3, paragraph 2.04 SETTING MATERIALS: add new subparagraph B as follows:

B. Portland Cement Mortar Installation Materials: Provide materials complying with ANSI A108.1 and as specified below.
  1. Reinforcing Wire Fabric: Galvanized welded wire fabric, 2 inches by 2 inches - WO.3 by WO.3 (16 ASW gage or 0.0625 inch diameter); comply with ASTM A 185 and ASTM A 82 for minimum wire size.
  2. Latex additive (water emulsion), manufacturer's standard, serving as replacement for part or all of gauging water, of type specifically recommended by latex additive manufacturer for use with job-mixed portland cement and aggregate mortar bed.

and paragraph 2.05 GROUTING MATERIALS, add new subparagraph B as follows:

B. Commercial- Portland Cement Grout: ANSI A118.6, color as selected.

and page 5, paragraph 3.03 FLOOR INSTALLATION METHODS, add new paragraph B as follows:

B. Exterior Paver Tile: Install to comply with requirements indicated below for setting-bed method, TCA installation method related to type of subfloor construction, and grout types.

  1. Portland Cement Mortar: ANSI A108.1.
    a. Deck, Membrane: TCA F103
    B. Grout: Commercial portland cement.

ITEM NO.26: DIVISION 10, SECTION 10050 PREFABRICATED SPECIALTIES: Page 1, paragraph 1.02 DESCRIPTION OF WORK, subparagraph B, add new articles 5, 6 and 7 as follows:

5. Window blinds
6. Fire extinguisher cabinets
7. Security Screens

and page 3, add new paragraph 2.05, 2.06 and 2.07 as follows:

2.05 WINDOW BLINDS: Provide at windows as indicated.

A. Horizontal blinds consisting of headrail containing operating mechanism, bottom rail to prevent twisting and sagging and 1" wide slats designed and spaced to overlap for light exclusion.

   1. Slat material Plastic in color selected by Architect from manufacturer's standards.
   2. Ladders: Polyester cord.
   3. Wand operator: Clear plastic

B. Distributor: Sears Roebuck and Co. or equivalent product as approved by Architect.

2.06 FIRE EXTINGUISHER CABINETS:

A. Provide fire extinguishers located in accordance with "NFPA 10 Portable Fire Extinguishers" requirements.

B. Class A, B and C, multi-purpose dry chemical 10 lb. cylinder.

C. Fabricate cabinet of enameled steel sheet to contain portable fire extinguishers; color as selected by Architect.

   1. Fully recessed, welded construction
   2. Break glass panel door
   3. Manufacturer's standard operating hardware including inside latch and lock and continuous type door hinge.
   4. Indentify cabinet with manufacturer's standard lettering spelling "FIRE EXTINGUISHER" painted on door.

D. Manufacturer: J.L. Industries, Larsen's Manufacturing Co. or Muckle Manufacturing.

2.07 SECURITY SCREENS:

A. Fabricated of extruded aluminum alloy 6063T-6 and consisting of main frame, concealment plate, sub frame, scribes, wire cloth, concealed hinges, locking bolts and emergency quick release.

1. Main frame minimum wall thickness of .090; Corners welded and ground smooth.
2. Concealment plate wall thickness of .090; providing concealment of wire attachment and locking bolts.
3. Subframe wall thickness of .180 and 0.90; corners welded and ground smooth.
4. Brace wall thickness of .090; attached through wire at 4" intervals as required by manufacturer.
5. Scribe wall thickness of .062; applied at head and jambs as required.
6. Finish: Manufacturer's standard painted finish. Color as selected by Architect to match window frames.
7. Wire cloth type 302/304 (18/8) stainless steel woven 12 mesh per inch from .028 diameter wire; tensile strength not less than 800 lbs. per linear inch after weaving.
8. Hardware: Emergency quick release mechanism simultaneously actuating two or more hardened steel bolts.

B. Manufacturer: Airtec Corporation.

ITEM NO.27: DIVISION 11, SECTION 11450 KITCHEN APPLIANCES: Page 1, paragraph 1.04 QUALITY ASSURANCE, subparagraph B, article 1, after word "General" add word "Electric".

ITEM NO.28: DIVISION 15, SECTION 15500, HEATING VENTILATING AND AIR CONDITIONING, page 1, paragraph 1.01 GENERAL, Subparagraph A, add article 9 after article 8 as follows:

9. Install smoke detectors in supply ductwork for air handling units; AHU-5, AHU-6 (Drawing H-2), AHU-7 (Drawing H-5), AHU-1, AHU-2, AHU-3 and AHU-4 (Drawing H-7). Install in accordance with NFPA 72E. Smoke detectors; on detection of smoke,

shall trigger the shut-down of their respective HVAC unit.

ITEM NO.29: DIVISION 15, SECTION 15500 HEATING VENTILATING AND AIR CONDITIONING, page 2, paragraph 1.02 RELATED WORK SPECIFIED ELSEWHERE, subparagraph C, article 3, add item d after item c as follows:

d. Smoke detectors and associated wiring in ductwork for air handling units listed in Section 15500, paragraph 1.01, subparagraph A, article 9.

ITEM NO.30: DIVISION 16, SECTION 16010 ELECTRICAL, page 3, paragraph 1.02 SCOPE, subparagraph B, add article 24 after article 23 as follows:

23. Furnish and wire smoke detectors in supply ductwork for air handling units; AHU-5, AHU-6 (Drawing H-2), AHU-7 (Drawing H-5), AHU-1, AHU-2, AHU-3 and AHU-4 (Drawing H-7).

ITEM NO.31: DIVISION 16, SECTION 16010 ELECTRICAL, page 3, paragraph 1.02 SCOPE, subparagraph C, add article 9 after article 8 as follows:

9. Installation of smoke detectors in air handling unit supply duct-Section 15500, HVAC.

ITEM NO.32: DIVISION 16, SECTION 16010 ELECTRICAL, pages 22 and 23, delete references to color of switches, receptables and plates. Colors to be selected by Architect.

ITEM NO.33: DIVISION 16, SECTION 16010 ELECTRICAL, page 38, paragraph 2.28 FIRE ALARM SYSTEM, Subparagraph I, add new paragraph after existing paragraph as follows:

. Smoke detectors installed in ductwork for air handling unit listed in Section 16010, paragraph 1.02, Subparagraph B, item 24 shall trigger the shut-down of their respective HVAC unit on detection of smoke. Install in accordance with NFPA 72E.

ITEM NO.34: DIVISION 16, SECTION 16010 ELECTRICAL, page 39, paragraph 2.28 FIRE ALARM SYSTEM, Subparagraph L, add Subparagraph L.1. to follow subparagraph L as follows:

L.1 Annunciator shall be graphic display annunciator as directed on drawing E-3. The annunciator shall include indications that show the following.

a. Zone of alarm.
b. Power on indicator.
c. System trouble indicator.
d. Fan system status.

The annunciator shall match the artwork supply in the architectural work. The unit shall include a key lock assembly. Glare retardant protective covering and brushed aluminum trim. All wiring shall terminate to clamp type screw connections. Indications shall be back illuminated and lamps to be replaceable from the back without special tools. The operator or failure of the annunciator shall not interfere with the control system.

CHANGES TO DRAWINGS:

ITEM NO.35: Delete sheets SU-2, L1, L2, L3, L4, L5, L6, L7, L8 and incorporate into construction documents new drawings: SU-2, L-1, L-2, L-3, L-4, L-5, L-6, L7, L8 dated 2/16/90.

ITEM NO.36: On landscape drawings (L Sheets), material called "Gravel Borrow" refers to material called "Sand Gravel" in SPECIFICATION SECTION 02200 EARTHWORK, page 6, paragraph 2.02 C.

ITEM NO.37: Sheet L-5, Details 8 and 10, change 3000 psi to 4000 psi.

ITEM NO.38: Drawing A-6. Add two more roof hatches. New roof hatches to be located above egress stairs which go to fourth floor.

ITEM NO.39: Drawing A-5. Add fire separation door and frame in corridor to the right of column line 14. Door and frame to be "B" labeled with automatic closer.

ITEM NO.40: DRAWING A-17, SECTION B/A17, change metal roofing on top of bay window to membrane roof.

ITEM NO.41: In all kitchens,use moisture resistant gypsum wallboard behind kitchen counters.

ITEM NO.42: Provide signage for building, door, unit numbers, etc., in accordance with allowance set forth in the Contract.

ITEM NO.43: Drawings S-8 thru S-12. Extent of replacement of existing structural members, flooring and roof shall be changed to reflect that shown in the Demolition Drawing, Sheet D-1.

ITEM NO.44: Drawing P-5. Provide 2 1/2" fire hose valve and associated plumbing in 4th floor corridor outside of egress stair "E-1 similar" which is located between column lines 2 and 3.

ITEM NO.45: Add the following to Drawing E-3, FIRST FLOOR LIGHTING AND POWER PLAN 29A:

. Add fire alarm pull station at all unit entrances and exits.
. Annunciator panel at main entrance shall be graphic annunciator.
. Add smoke detector at bottom of all egress stairs.
. Add indicator strobe light at each townhouse entrance.
. Add fire alarm system horn/light unit in retail tenant space.

ITEM NO.46: Add the following to Drawing E-6, FOURTH FLOOR LIGHTING AND POWER PLAN PARCEL 29A:

. Add one (1) fire alarm system horn/light at roof decks.

ITEM NO.47: Add the following to Drawing E-8, MISCELLANEOUS DIAGRAMS PARCEL 29A, Fire Alarm Riser Diagram:

. Add wiring for fire alarm equipment. Add to fire alarm system as per drawings E-3, E-6 and E-7.
. Add stomper covers to all pull stations.
. Furnish smoke duct detectors in air handling units AHU-5, AHU-6 and AHU-7 and wiring to fire alarm control panel.
. Provide fan shut-down wiring and relays for AHU-5, AHU-6 and AHU-7.

ITEM NO.48: Add the following to Drawing E-7, MISCELLANEOUS SCHEDULES PARCEL 29A, Fire Zone Alarm Schedule:

. Provide separate zone for electric room.
. Add separate zones for each townhouse entrance.

ITEM NO.49: Add the following to Drawing E-11, FIRST FLOOR LIGHTING AND POWER PLAN PARCEL SE70-SE71:

. Add fire alarm pull station at all unit entrances.
. Add smoke detector at bottom of all egress stairs.
. Add indicator strobe light at each townhouse entrance.
. Add fire alarm system horn/light units in retail tenant spaces.

ITEM NO.50: Add the following to Drawing E-15, MISCELLANEOUS SCHEDULES SE70-71, Fire Alarm Zone Schedule.

. Provide separate zone for electric room.
. Add separate zone for each townhouse entrance.

ITEM NO.51: Add the following to Drawing E-16, MISCELLANEOUS DIAGRAM SE70-71, Fire Alarm Riser Diagram:

. Add wiring for fire alarm equipment. Add to fire alarm system as per drawings E-11 and E-15.
. Add stomper cover to all pull stations.
. Furnish smoke duct detectors in air handling units AHU-1, AHU-2, AHU-3 and AHU-4, and wiring to the fire alarm control panel.
. Provide fan shut-down wiring and relays for AHU-1, AHU-2, AHU-3 and AHU-4.

END OF ADDENDUM NO. 4.

ATTACHMENTS: SECTION 09200 LATH AND PLASTER

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements apply to the work of this Section.

1.02 DESCRIPTION OF WORK:

A. The extent of lath and plaster work is shown on the drawings.

B. The types of lath work specified in this section are:

1. Runner channel ceiling suspension system.
2. Metal furring.
3. Metal lathing for exterior plastering.
4. Accessories for thick-coat plastering.

C. The type of plastering required is:

1. Exterior portland cement plaster (stucco).

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. GYPSUM DRYWALL.

1.04 QUALITY ASSURANCE:

A. ANSI Standards: Comply with applicable requirements of ANSI A42.2 "Portland Cement and Portland Cement-Lime Plastering Exterior (Stucco) and Interior" and ANSI A42.3 - A42.4, except where more detailed or more stringent requirements are indicated.

B. Allowable Tolerances: For flat surfaces, do not exceed 1/4" in 8'- 0" for bow or warp of surface, and for plumb or level.

C. Industry Standards: comply with the recommendations of the "Plasterer's Manual", by the Portland Cement Assoc., except where more stringent requirements are indicated.

1.05 SUBMITTALS:

A. Product Data: Submit manufacturer's product specifications and installation instructions for each product, including data showing compliance with the requirements.

B. Standards: Submit a current copy of ANSI A42.2, A42.3, and A42.4 (current means in effect as of the date of these contract documents).

1.06 PRODUCT HANDLING

A. Delivery and storage of Materials: Except for sand and water, deliver materials to the site in sealed containers or bags fully identified with manufacturer's name, brand, type, and grade. Store materials in a dry, well-ventilated space, under cover and off the ground.

B. Protect lath and metal support materials from exposure to weather. Deliver in manufacturer's unopened containers or bundles, identified with name, brand, type and grade. Store inside in a dry, ventilated space.

1.07 JOB CONDITIONS:

A. Installer must examine surfaces to receive cement plaster, including grounds and other accessories which act as grounds or screeds, and shall notify the Contract (in writing) of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

B. Protect contiguous work from moisture deterioration and soiling which might result from plastering operations. Provide temporary covering and whatever other provisions may be necessary to minimize harmful spattering of plaster on other work.

C. Cold Weather Requirements: Provide heat and protection (temporary or permanent) as required to protect each coat of plaster form freezing for a period of not less than 24 hours after application. Distribute heat uniformly to prevent concentration of heat on plaster near heat sources; provide deflection or protective screens.

1. Protect plaster against freezing when ambient temperature is less than 32 degrees F or less and falling. Heat materials and provide temporary protection and heat as required any ACI 306.

D. Warm Weather Requirements: Protect plaster against uneven and excessive evaporation and from strong flows of dry air, both natural and artificial. Apply and cure plaster as required by climatic and job conditions to prevent dryout during cure period. Provide suitable coverings, moist curing, barriers to deflect sunlight and wind, or combinations of these, as required.

PART 2 PRODUCTS

2.01 LATH AND SUSPENSION MATERIALS:

A. General: Except where otherwise indicated, provide the type, weight, grade and finish of materials, and include for each system the clips, fasteners, ties, reinforcing, stiffeners, shoes, tracks, hangers, brackets, anchors, accessories and trim as recommended by the manufacturer for the application indicated.

B. Metal and Finishes:

1. Exterior Components: Hot-dip galvanized finish: ASTM A 525 G90 for 18 gage and lighter formed metal products, ASTM A 123 galvanized after fabrication for 16 gage and heavier products.
2. Exposed Plastering Accessories: Provide zinc alloy accessories.

C. Wire Ties: Galvanized soft steel wire.

D. Ceiling Suspension/Furring Materials:

1. Runner Channels: 2", 0.59 lb. per ft. cold-rolled or 1.26 lb. per ft. hot-rolled steel.
2. Cross Furring: 3/4" x 0.3 lb. per ft. cold-rolled channel steel.
3. Hangers: Wire or rod type sized to comply with ASNI A42.4.

E. Metal Lathing Materials: comply with ML/SFA "Specs. for Metal Lathing and Furring" and "Technical Bulletin 101" for selection of lath.

1. Product standards: Comply with FS QQ-L-101.
2. Galvanize self-furring rib lath, 3/8": 3.4 lbs. per sq. yd., 3/8" rib depth.

2.02 PLASTERING MATERIALS:

A. General: Except as otherwise indicated, provide standard products recommended by the manufacturer for the application indicated, complying with ASNI A 42.2, and provide either neat or ready-mixed (where available) at Installer's option.

B. Base-Coat Cement: Portland cement: ASTM C 150, Type I or IA.

C. Base-Coat Lime: ASTM C 206, special finishing hydrated lime, known as Type S.

D. Base-Coat Aggregate: Sand (ASNI A42.2).

E. Prepared Finish-coat: Factory-prepared finish for portland cement plaster base-coat, recommended by the manufacturer for the application indicated, ready for mixing with water at time of application.

1. Color and Texture: Provide product as required to produce finish coat.
2. Color: As selected by Architect from manufacturer's standard colors for prepared finish-coats.
3. Texture: Product suitable for standard"sand float" finish.

2.03 PLASTERING ACCESSOIRES:

A. Provide the type of accessories indicated or, if not otherwise indicated, provide the types recommended by the plaster manufacturer for the applications indicated. Include fasteners, corner ends, casing beads cornerite, stripite, base screed, and expansion/control joints as required to produce a complete installation of plaster complying with industry standards. Coordinate depth of accessories with depth of plaster required. Except as otherwise indicated provide standard gage galvanize accessories.

1. Zinc Alloy Accessories: For exterior work, provide zinc alloy (white metal) accessories.
2. For exterior work do not use permanent metal screeds, and casing beads except where specifically indicated.

B. One-Piece Control Joint: Folded pair of 26 gage screeds, with perforated or expanded flanges.

2.04 PORTLAND CEMENT PLASTER MIXES:

A. General: Except as otherwise indicated, comply with ANSI A42.2 for the proportioning of materials and manner of mixing the plaster for each required application (options therein are Installer's option unless otherwise indicated); comply with the plaster manufacturer's instructions which are more stringent than ANSI A42.2.

1. Scratch Coats: Include hair or fiber in mix for the scratch coat on metal lath or reinforcement.

PART 3 EXECUTION

3.01 INSTALLATION OF LATH AND METAL SUPPORT:

A. Ceiling Anchorages: Coordinate work with structural ceiling work to ensure that inserts and other structural anchorage provisions have been installed to receive ceiling hangers.

B. Comply with ML/SFA "Specs. for Metal Lathing and Furring" and with manufacturer's installation instructions.

C. Isolation: Where lathing and metal support system abuts building structure horizontally, isolate the work from structural movement sufficiently to prevent transfer of loading into the work from the building structure. Install slip or cushion type joints to absorb deflections but maintain lateral support.

1. Frame both sides of control joints independently, and do not bridge joints with furring and lathing accessories.

D. Fixture Support Framing: Install supplementary framing, blocking and bracing where work is indicated to support fixtures and other work requiring attachment and support.

E. Wire Tieing: Except as otherwise indicated, tie exterior furring with 14 gage or double 16 gage wire and tie exterior lath with 16 gage wire.

F. Splicing Member: Lap furring members 8" and runner channels 12", and wire-tie near each end of lap. Splice plastering accessories by use of concealed splines, anchored to prevent offsets.

G. Installation of Ceiling Suspension:

1. Space runner channels as indicated or, if not indicated, 4'-0" o.c.; and space hangers along channels as indicated or, if not indicated, 4'-0" o.c.
2. Secure hangers to channels and to building structure only, by looping and wire-tying wherever possible.
   a. Secure with metal hanger clips or devices on closed-web steel members with steel decking.
3. Level runner channels to a tolerance of 1/8" in 12'-0"
4. Space furring members 16" o.c., except as otherwise indicated.

H. Installation of Metal Lathing: Install by wire-tying or clipping to supports or substrate in the manner indicated and in accordance with industry standards.

J. Installation of Plastering Accessories:

1. Anchor each flange of accessories 8" o.c. to plaster base.
2. Miter or cope accessory corners, and install with tight joints accurately aligned.
3. Set accessories plumb, level and true to line, with a tolerance of 1/8" in 10'-0".
4. Install casing beads at termination of plaster work, except where special screeds or frames act as casing beads.
   a. For exterior work, set casing beads 1/4" from abutting frames and other work (for application of sealant).
5. Install prefabrication control joints of one-piece design where shown as "control joint"
   a. If not otherwise indicated, install control joints at maximum 12' distance in the work in either direction; coordinate with other elements of the work as directed by the Architect.

3.02 PREPARATIONS FOR PLASTERING:

A. Clean plaster bases and substrates for direct application of portland cement plaster, removing loose material and substances which might impair the work.

3.03 INSTALLATION OF CEMENT PLASTER (STUCCO):

A. General:

1. Standards: Except as otherwise indicated, comply with ANSI A42.2 for plastering (options therein are Installer's options unless otherwise indicated); comply with plaster manufacturer's instructions which are more stringent than ANSI A42.2; and comply with the recommendations of the "Plasterer's Manual" by PCA.
2. Do not use materials which are frozen, caked or lumpy or which are dirty or contaminated by foreign materials. Use only clean water free from impurities which might impair the plaster work; do not use water which has been used to clean tools.
3. Do not use excessive water in the mixing and application of plaster materials.
4. Sequence plastering applications with other work in accordance with recognized industry practices.
   a. Delay application of exterior finish-coat plastering (stucco) until adjoining work has been completed.
5. Plaster flush with metal frames and other built-in metal items or accessories which act as a plaster ground, unless otherwise shown.

6. Use mechanical mixing equipment, except small applications requiring less than one bag of plastering material may be hand mixed. Machine or hand application of plaster is Installer's option.

B. Plaster Applications:

1. Apply 3-Coat plaster over metal lathed and metal reinforced substrates (scratch/level, brown, and finish coats).
2. Plaster Thickness: Apply total plaster thickness as shown and comply with ASNI A42.2 and recognized industry standards.
    a. On metal reinforcing, apply minimum scratch-coat of 3/8".
    b. Apply finish-coat plaster not less than 1/8" thick, and increase thickness as required to achieve required texture.
3. Finish-Coat Texture/Pattern: Sand-float Plaster Finish: Where indicated, float finish-coat application to a uniform sand-flat texture. Provide normal sand-float texture as directed by Architect.
4. Curing Portland Cement Plaster: Protect each coat of cement plaster work from dry-out for a period of 20 to 24 hours after placement (or until curing operation will not damage surface), and moisture-cure not less than 48 hours after time of placement. Moisture-cure by maintaining in a moist condition, by frequent fog-spraying with water and by protecting from fast dry-out with covering of polyethylene film or similar enclosure. Dry each coat to a uniform moisture content before installing succeeding coat, and do not install finish-coat until base-coat has been dryed at least 5 days.

3.04 CUTTING AND PATCHING:

A. Cut, patch, repair and point-up cement plaster as required and as necessary to accommodate other work. Repair cracks and indented surfaces. Point-up finish plaster surfaces around items which are built into or penetrate plaster surfaces. Repair or replace the work to eliminate blisters, buckles, check cracking, dry-outs, efflorescence, excessive pinholes, and similar imperfections. Repair or replace the work as necessary to comply with specified tolerances and required visual effects.

3.05 CLEANING AND PROTECTION:

A. Remove temporary covering and whatever other provisions were made to minimize spattering of plaster on other work. Promptly remove plaster from door frames, windows and other surfaces. Repair surfaces which have been stained, marred or otherwise damaged during the plastering work. When plastering work is completed, remove unused materials, containers, and equipment and plaster debris.

B. Provide for protection of cement plaster from deterioration and damage during remainder of construction period.

END OF SECTION

To: All General Contractors

From: Roxbury Corners Limited Partnership

Re: Non-Discrimination in Employment Requirements

All General Contractors submitting contract prices on behalf of the Roxbury Corners Housing Cooperative Project must adhere to the following regulations. These regulations and requirements will be included as part of the construction agreement documents for this project.

Non-Discrimination in Employment

The Redeveloper, for itself, its successors and assigns, agrees that in the construction of the Improvements in accordance with the provisions of this Agreement.

a. The Redeveloper will not discriminate against any employee or applicant for employment because of race, color, sex, religion or national origin. The Redeveloper will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising, layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Redeveloper agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Authority setting forth the provisions of this non-discrimination clause.

b. The Redevelopment will, in all solicitations or advertisements for employees placed by or on behalf of the Redeveloper, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex or national origin.

c. The Redeveloper will send to each labor union or representative of workers with which the Redeveloper has a collective bargaining agreement or other contract of understanding, a notice, to be provided advising the said labor union or worker's representative of the Redeveloper's commitments under Section 202 of Executive Order 11246 of September 24, 1965, as amended by Executive Order 11375 of October 13, 1967, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

d. The Redeveloper will comply with all provisions of Executive Order 11246 of September 24, 1965, as amended by Executive Order 11375 of October 13, 1967, and of the rules, regulations and relevant orders of the Secretary of Labor.

e. Redeveloper, for itself and all successors and assigns, further agrees that in the redevelopment of the property and in all construction activity undertaken with respect thereto, Redeveloper shall use best efforts to pursue and cause the general contractor to pursue the efforts hereinafter described with a goal to employ workers in construction so that the worker hours on a craft-by-craft basis shall be performed as follows:

at least 50% by bonafide City of Boston residents;
at least 25% by minorities; and
at least 10% by women.

Such efforts consist of the following:

i. Redeveloper shall incoporate in every general construction contract management agreement an enumeration of the foregoing worker hour goals and shall impose a responsibility upon the contractor to pursue the efforts enumerated in this Section (e) and to incorporate such worker hour goals in all subcontracts an impose upon all subcontractors the obligation to pursue such efforts;

ii. Authority, Redeveloper, contractor, and every subcontractor shall each designate an individual to serve as affirmative action officer for the purpose of carrying out the efforts to achieve worker hour goals set forth herein;

iii. Contemporaneously with the start of construction, the affirmative action officers and other interested representatives action officers and other interested representatives of the Authority, Redeveloper, contractor, and each subcontractor then selected shall hold a pre-job conference with appropriate union representatives of the construction trade unions for the purpose of reviewing the worker hour goals applicable to the improvements and the manning requirements for construction activity over the life of the construction period;

iv. Each request for qualified construction workers made by any person involved in the construction of the Improvements to a union hiring hall or business agent shall contain a recitation of such worker hour goals and a request that qualified referees for construction positions on the Improvements be selected in the same proration as such goals; provided however, that if at the time of any such manning requests the requesting party's workforce composition falls short of any one or more of such goals, such manning request shall seek qualified referees in such proration among such categories as would be necessary to more fully achieve such goals. In the event that the union hiring hall or business agent to which or whom such a manning request has been submitted fails to comply with such request, the affirmative action officer of such requesting party shall seek to verify that insufficient workers in the categories specified in such request are then shown on the unemployed list maintained by such union hiring hall or business agent by seeking to obtain an affidavit from the union hiring hall representative or business agent to such effect. Copies of any affidavit so obtained shall be forwarded to the affirmative action officer of the Authority.

v. All persons applying directly to the contractor, or subcontractor for employment in contruction on ht project who are not employed by the party to whom application is made will be referred to the affirmative action officer of the Authority and a written record of such referral shall be made, a copy of which shall be sent to such officer; and

vi. In addition to the foregoing, the Redeveloper, and its successors and assigns, shall comply, as determined by the Authority, with the Mayor's Executive Order on Minority and Women Business Enterprise Development, dated December 17, 1987, and effective December 30, 1987, which sets forth the following standards, relative to contracting with Minority and Women Business Enterprises in all construction activity undertaken with respect to the Property including the procurement of goods and services:

A) at least 15% of the total construction contract amount shall be expended on Minority Business Enterprises;

B) at least 5% of the total construction contract amount shall be expended on Women Business Enterprises.

vii. The Redeveloper shall incorporate in every general construction contract or construction management agreement an enumeration of the foregoing goals and shall impose a responsibility upon the general contractor to submit the following information to the Redeveloper and the Authority prior to the commencement of construction:

A) Projections of the types of work under the proposed contract that the general contractor intends to have performed by subcontract, the types of materials and services that the general contractor intends to have supplied by vendor contract, and an approximate timetable for the execution of such subcontracts and vendor contracts.

B) A completed Minority Business Utilization Form, provided by the Authority, which lists the Minority Business Enterprise which will perform work or supply goods and services, and includes any third-tier or other subcontracts to Women Business Enterprises. A completed Women Business Utilization Form, provided by the Authority, which lists the goods and services, and includes any third-tier or other subcontracts to Women Business Enterprises. Each Women or Minority Business Enterprise shall be reported on said Form as either performing work or supplying goods or services, but not both.

C) A completed and signed Letter of Intent, in a form established by the Authority, for each Minority or Women Business Enterprise proposed to be used by the general contractor, other than the general contractor itself, which lists the contract items the Minority or Women Business Enterprise has proposed to perform or supply, and the proposed price for each item.

D) A copy of executed subcontracts and vendor contracts shall be made available to the Authority upon request. No Minority or Women Business Enterprise may be removed from the construction site, nor may any changes be made in the work or supply assignments, or reduction made in the dollar value thereof unless the general contractor proposes to substitute one or more Minority or Women Business Enterprises subject to the Authority's prior approval in order to satisfy the stated requirements of this Section 306.

f. The Redeveloper, for itself and all successors and assigns, further agrees that in redevelopment of the Property, Redeveloper shall comply with the provisions of the First Source Agreement relating to permanent employment positions for city residents.

g. The Redeveloper will furnish all information and reports required by Executive Order 11246 of September 24, 1965, as amended by Executive Order 11375 of October 13, 1967, and by the rules, regulations, and orders of the Secretary of Labor, or the Secretary of Housing and Urban Development pursuant thereto, and will permit access to the Redeveloper's books, records, and accounts by the Authority, the Secretary of Housing and Urban Development, and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations and orders.

h. In the event of the Redeveloper's noncompliance with the non-discrimination clauses of this Section, or with any of the said rules, regulations, or orders, this Agreement may be cancelled, terminated, or suspended in whole or in part and the Redeveloper may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965 as amended by Executive Order 11375 of October 13, 1967, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, as amended by Executive Order 11375 of October 13, 1967, or by rules, regulations, or orders of the Secretary of Labor, or as otherwise provided by law.

i. The Redeveloper will include the provisions of Paragraphs a) through f) of this Section in every employment contract, whether union or nonunion, and in every other contract or purchase order, and will require the inclusion of these provisions in every subcontract entered into by any of his contractors, unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, as amended by Executive Order 11375 of October 13, 1967, so that such provisions will be binding upon each such contractor, subcontractor, or vendor as the case may be. The Redeveloper will take such action with respect to any construction contract, subcontract, or purchase order as the Authority or the U.S. Department of Housing and Urban Development may direct as a means of enforcing such provisions, including sanctions for noncompliance; provided, however, that in the event the Redeveloper becomes involved in or is threatened with litigation with a subcontractor or vendor as a result of such direction by the Authority or the U.S. Department of Housing and Urban Development, the Redeveloper may request the United States to enter into such litigation to protect the interest of the United States.

For the purpose of including such provisions in any construction contract, subcontract, or purchase order, as required hereby, the first three lines of this Section shall be changed to read: "During the performance of this Contract, the Contractor/Subcontractor/Vendor agrees as follows:" and the term "Redeveloper" as it appears throughout this Section shall be changed to "Contractor", "Subcontractor", or "Vendor", as the case may be.

GENERAL DOCUMENTS AND SPECIFICATIONS FOR:

PROJECT:
ROXBURY CORNERS HOUSING
BOSTON, MASSACHUSETTS

DEVELOPERS:
UNITED SOUTH END/LOWER ROXBURY
DEVELOPMENT CORPORATION
COMMUNITY BUILDERS

ARCHITECT:
CPF/DOMENECH & HICKS, INC.
155 MASSACHUSETTS AVENUE
BOSTON, MASSACHUSETTS 02115
617 267-6408

CONSULTANTS:

STRUCTURAL ENGINEERS:
WEIDLINGER ASSOCIATES
44 BRATTLE STREET
CAMBRIDGE, MA 02138
617 876-9666

MECHANICAL/ELECTRICAL ENGINEERS:
LEMESSURIER CONSULTANTS
1033 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02138
617 868-1200

LANDSCAPE ARCHITECTS:
THE HALVORSON COMPANY, INC.
161 MASSACHUSETTS AVENUE
BOSTON, MASSACHUSETTS 02115
617 536-0380

GEOTECHNICAL ENGINEERS:
GOLDBERG-ZOINO & ASSOCIATES
320 NEEDHAM STREET
NEWTON UPPER FALLS, MASSACHUSETTS 02164
617 969-0050

SPECIFICATIONS:
RICHARD E. PALMER, AIA/CSI
17 WEYBRIDGE LANE
BROOKLINE, MA 02146
617 734-2506

DATE:
8 DECEMBER 1989

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SECTION 16010 ELECTRICAL 61

United South End/Lower Roxbury Development Corporation
434 Massachusetts Avenue
Boston, Massachusetts 02118
Telephone (617) 266-5451

TO: GENERAL CONTRACTOR

DATE: December 8, 1989

RE: ROXBURY CORNERS HOUSING COOPERATIVE PROJECT

==

The United South End/Lower Roxbury Development Corporation, developer of the Roxbury Corners Housing Project, invites you to submit a contract price for the construction of a 54-unit project located in the South End/Lower Roxbury section of Boston.

The contract price should be a lump sum price based upon December 8th drawings. We are requesting you to submit a price based upon a complete project which meets City and State code requirements as well as the information contained in Plans, Specifications, and other materials included in this package. In addition we would like you to list all exceptions in drawings and specifications as well as inconsistencies and how you propose to solve them and at what cost. We would also like you to provide alternate pricing on items you deem could be substituted at a cost savings.

Lastly, please identify your unit prices for excavation on the form provided.

Please furnish your construction proposal on MHFA Form 2328 in the following manner:

Page 1 -- Composite
Page 2 -- New Construction of 135-141 Northampton St.
Page 3 -- New Construction of 1797-1815 Washington St.
Page 4 -- Rehabilitation of 1777-1781/1783-1789 Washington St.

The commercial tenants are anticipated to be relocated from the Parcel SE70-71 site no later than March 31, 1990.

We anticipate a construction start of January 31, 1990 and a construction period of one year. Please provide a price that would be applicable should construction be delayed until April 30, 1990.

UDC

This project is being financed by Massachusetts Housing Finance Agency and is subject to State Prevailing Wages, City of Boston Public Job Regulations, and MHFA Equal Opportunity/ Affirmative Action Requirements. The anticipated project budget is $5.9 million.

Site visit is scheduled for Thursday, December 14th at 9:30 AM. Interest parties shall meet at the Roxbury Corners site located at 1783-1789 Washington Street (in front of Jack's Mens Shop).

A pre-submission conference will be held on Friday, December 15th at 10:00 AM. The pre-submission conference will be held at The Community Builders, Inc. office located on the 5th Floor of 95 Berkeley Street in Boston.

The developer has no obligation to accept any contract proposals submitted.

Questions concerning the enclosed materials should be directed to Karen Breslawski, Project Manager, CPF/Domenech & Hicks, 155 Massachusetts Avenue, Boston, MA 02115. Telephone #(617) 267-6408.

Syvalia Hyman, III
President

Enc.
JJ/nsb

LIST OF ALTERNATES

Division	Section	Specified	Alternates	Cost Difference

SCHEDULE OF UNIT PRICES

In accordance with the terms and conditions of the Contract and as part of the base proposal, the undersigned agrees to the following unit prices for designated work.

It shall be noted that work deducted from the basic contract covered by these stated unit prices will be DEDUCTED at the stated value LESS 15 percent.

Unit #1 - Contaminated excavation material disposed of at a DEQE approved Massachusetts Sanitary Land Fill Site ---------------------------------- $__________/cu.yd.

Unit #2 - Ordinary Fill, purchased placed and compacted ----------------------------- $__________/cu.yd.

Unit #3 - Foundation Wall Concrete, complete including forms, concrete, reinforcing, finish and all other accessories -------------------------------------- $__________/cu.yd.

LIST OF EXCEPTIONS/INCONSISTENCIES

Division	Section	Specified	Issue	Alternative/Solution	Cost

Exhibit 5

MHFA-2328 rev 1.0 10/6/86

MASSACHUSETTS HOUSING FINANCE AGENCY
CONTRACTOR'S AND/OR MORTGAGOR'S COST BREAKDOWN

Project name ______________________ MHFA Project No. ________
Project location ______________________ Date ________

BREAKDOWN BASED ON FOLLOWING:
Drawings & Specifications date: __________ Architect: ______________________
Total building square footage: __________ ___0BR ___1BR ___2BR ___3BR ___4BR-
Construction start date: __________ Construction time: __________ Mo

Li	Dv	TRADE ITEM	TOTAL AMOUNT	TRADE DESCRIPTION
1	3	concrete		
2	4	masonry		
3	5	metals		
4	6	rough carpentry		
5	6	finish carpentry		
6	7	waterproofing		
7	7	insulation		
8	7	roofing		
9	7	sheet metal		
10	8	doors		
11	8	windows		
12	8	glass		
13	9	lath & plaster		
14	9	drywall		
15	9	tile work		
1		acoustical		
17	9	wood flooring		
18	9	resilient flooring		
19	9	paint & decorating		
20	10	specialties		
21	11	special equipment		
22	11	cabinets		
23	11	appliances		
24	12	blinds & shades		
25	12	carpet		
26	13	special construction		
27	14	elevators		
28	15	plumbing & hot water		
29	15	heat and ventilation		
30	15	air conditioning		
31	16	electrical		
32	Accessory Buildings			
33	Other/misc			
34	SUBTOTAL STRUCT(1 to 33)			
35	2	earth work		
36	2	site utilities		
37	2	roads & walks		
38	2	site improvement		
39	2	lawns & planting		
40	2	unusual site cond		
41	SUBTOTAL LAND(35 to 40)			
4	TOTAL IMPROVEMENTS(34+41)			
43	1	general conditions		
44	SUBTOTAL(42+43)			
45	1	builders overhead		
46	1	builders profit		
47	TOTAL AMOUNT(44+45+46)			

Mortgagor ______ ______________ By ______________ Date ________

Contractor ______ ______________ By ______________ Date ________

This breakdown represents the Contractor's and/or Mortgagor's estimate for costs and services to construct the above project on the above start date.

NEW CONSTRUCTION
1797-1815 WASHINGTON STREET

(PARCEL 29A)
Exhibit 5

HFA-2328 rev 1.0 10/6/85

MASSACHUSETTS HOUSING FINANCE AGENCY
CONTRACTOR'S AND/OR MORTGAGOR'S COST BREAKDOWN

ject name ______________________ MHFA Project No. ________
oject location ______________________ Date ________

EAKDOWN BASED ON FOLLOWING:
awings & Specifications date: ________ Architect: ________________
tal building square footage: ________ ___0BR ___1BR ___2BR ___3BR ___4BR-
nstruction start date: ________ Construction time: ________ Mo

	Dv	TRADE ITEM	TOTAL AMOUNT	TRADE DESCRIPTION
	3	concrete		
	4	masonry		
	5	metals		
	6	rough carpentry		
	6	finish carpentry		
	7	waterproofing		
	7	insulation		
	7	roofing		
	7	sheet metal		
0	8	doors		
	8	windows		
	8	glass		
	9	lath & plaster		
	9	drywall		
5	9	tile work		
		acoustical		
7	9	wood flooring		
8	9	resilient flooring		
9	9	paint & decorating		
0	10	specialties		
1	11	special equipment		
2	11	cabinets		
	11	appliances		
	12	blinds & shades		
5	12	carpet		
6	13	special construction		
7	14	elevators		
8	15	plumbing & hot water		
9	15	heat and ventilation		
0	15	air conditioning		
1	16	electrical		
2	Accessory Buildings			
3	Other/misc			
4	SUBTOTAL STRUCT(1 to 33)			
5	2	earth work		
6	2	site utilities		
7	2	roads & walks		
8	2	site improvement		
9	2	lawns & planting		
0	2	unusual site cond		
1	SUBTOTAL LAND(35 to 40)			
	OTAL IMPROVEMENTS(34+41)			
3	1	general conditions		
4	SUBTOTAL(42+43)			
5	1	builders overhead		
6	1	builders profit		
7	TOTAL AMOUNT(44+45+46)			

ortgagor ________ ________________ By ________________ Date ________

ontractor ________ ________________ By ________________ Date ________

This breakdown represents the Contractor's and/or Mortgagor's estimate for osts and services to construct the above project on the above start date.

135-141 NORTHAMPTON STREET
(PARCEL SE-70)
Exhibit 5

MHFA-2328 rev 1.0 10/6/8

MASSACHUSETTS HOUSING FINANCE AGENCY
CONTRACTOR'S AND/OR MORTGAGOR'S COST BREAKDOWN

Project name ______________________ MHFA Project No. ________
Project location ______________________ Date ________

BREAKDOWN BASED ON FOLLOWING:
Drawings & Specifications date: __________ Architect: ____________________
Total building square footage: __________ ___0BR ___1BR ___2BR ___3BR ___4BR-
Construction start date: __________ Construction time: __________ Mo

Li	Dv	TRADE ITEM	TOTAL AMOUNT	TRADE DESCRIPTION
1	3	concrete		
2	4	masonry		
3	5	metals		
4	6	rough carpentry		
5	6	finish carpentry		
6	7	waterproofing		
7	7	insulation		
8	7	roofing		
9	7	sheet metal		
10	8	doors		
11	8	windows		
12	8	glass		
13	9	lath & plaster		
14	9	drywall		
15	9	tile work		
16	[illegible]	acoustical		
17	9	wood flooring		
18	9	resilient flooring		
19	9	paint & decorating		
20	10	specialties		
21	11	special equipment		
22	11	cabinets		
23	11	appliances		
24	12	blinds & shades		
25	12	carpet		
26	13	special construction		
27	14	elevators		
28	15	plumbing & hot water		
29	15	heat and ventilation		
30	15	air conditioning		
31	16	electrical		
32		Accessory Buildings		
33		Other/misc		
34		SUBTOTAL STRUCT(1 to 33)		
35	2	earth work		
36	2	site utilities		
37	2	roads & walks		
38	2	site improvement		
39	2	lawns & planting		
40	2	unusual site cond		
41		SUBTOTAL LAND(35 to 40)		
4[illegible]		TOTAL IMPROVEMENTS(34+41)		
43	1	general conditions		
44		SUBTOTAL(42+43)		
45	1	builders overhead		
46	1	builders profit		
47		TOTAL AMOUNT(44+45+46)		

Mortgagor ______ ______________ By ______________ Date ________

Contractor ______ ______________ By ______________ Date ________

This breakdown represents the Contractor's and/or Mortgagor's estimate for osts and services to construct the above project on the above start date.

Exhibit 5

MHFA-2328 rev 1.0 10/6/86

MASSACHUSETTS HOUSING FINANCE AGENCY
CONTRACTOR'S AND/OR MORTGAGOR'S COST BREAKDOWN

Project name ______________________________ MHFA Project No. ________
Project location ___________________________ Date ________

BREAKDOWN BASED ON FOLLOWING:
Drawings & Specifications date: __________ Architect: ____________________
Total building square footage: __________ ___0BR ___1BR ___2BR ___3BR ___4BR+
Construction start date: __________ Construction time: __________ Mo

Li	Dv	TRADE ITEM	TOTAL AMOUNT	TRADE DESCRIPTION
1	3	concrete		
2	4	masonry		
3	5	metals		
4	6	rough carpentry		
5	6	finish carpentry		
6	7	waterproofing		
7	7	insulation		
8	7	roofing		
9	7	sheet metal		
10	8	doors		
11	8	windows		
12	8	glass		
13	9	lath & plaster		
14	9	drywall		
15	9	tile work		
1		acoustical		
17	9	wood flooring		
18	9	resilient flooring		
19	9	paint & decorating		
20	10	specialties		
21	11	special equipment		
22	11	cabinets		
23	11	appliances		
24	12	blinds & shades		
25	12	carpet		
26	13	special construction		
27	14	elevators		
28	15	plumbing & hot water		
29	15	heat and ventilation		
30	15	air conditioning		
31	16	electrical		
32	Accessory Buildings			
33	Other/misc			
34	SUBTOTAL STRUCT(1 to 33)			
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36	2	site utilities		
37	2	roads & walks		
38	2	site improvement		
39	2	lawns & planting		
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41	SUBTOTAL LAND(35 to 40)			
4	OTAL IMPROVEMENTS(34+41)			
43	1	general conditions		
44	SUBTOTAL(42+43)			
45	1	builders overhead		
46	1	builders profit		
47	TOTAL AMOUNT(44+45+46)			

Mortgagor ______ ______________ By ______________ Date ________

Contractor ______ ______________ By ______________ Date ________

This breakdown represents the Contractor's and/or Mortgagor's estimate for
sts and services to construct the above project on the above start date.

OWNER-CONTRACTOR AGREEMENT
Roxbury Corners Housing Project

This Owner-Contractor Agreement (this "Agreement") is made this ____ day of _____________, 1989, by and between _________________________________ hereinafter called "Owner" and ____________________________, doing business as a corporation, hereinafter called "Contractor".

FOR AND IN CONSIDERATION OF the promises, payments and agreements hereinafter mentioned:

1. Work Required. The Contractor will commence and complete all work (the "Work") required by the documents listed in Section 4 below (the "Contract Documents") for the conversion and rehabilitation of the Roxbury Corners Housing Project at 1777-1781/1783-1789/1797-1815 Washington Street and 135-141 Northampton Street (the "Project"), and Contractor will furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of the Project described herein and in the Contract Documents.

2. Notice to Proceed; Completion. Owner shall give Contractor a notice to proceed (the "Notice to Proceed") within 120 days of the date hereof. The Contractor will commence the work required by the Contract Documents within 14 calendar days after the date of the Notice to Proceed, and will achieve Substantial Completion within 365 calendar days of the Notice to Proceed unless the period for completion is extended otherwise by the Contract Documents. The Contractor agrees that, in the event it fails to achieve Substantial Completion by the date required herein and because Owner's damages in such event will be difficult to ascertain, then, in such event, Contractor shall pay to Owner (and Owner may deduct from any payments due Contractor) as liquidated damages, and not as a penalty, $2,000 per day until Substantial Completion is achieved. The parties agree that the above described liquidated damages shall only be in lieu of Owner's actual damages for delayed Substantial Completion, and shall not preclude Owner from suing for its actual damages for breaches of this Agreement by Contractor other than delayed Substantial Completion, including but not limited to breaches of express or implied warranties, or failure to perform or abide by the other terms and conditions hereof.

3. Contract Sum. The Contractor agrees to perform all of the Work described in the Contract Documents and comply with the terms therein for the sum of $__________, subject to addition, reduction, or adjustment as set forth in the Contract Documents and based on the values and/or unit prices set forth in Exhibit A.

3. Adjustment to Contract Sum.

The Contract Sum will be adjusted upward or downward in accordance with the following alternates, as specified in the Alternates section:

Alternate No. 1.	Sitework	Add/Deduct	$________
Alternate No. 2.	Wood and Plastics	Add/Deduct	$________
Alternate No. 3.	Thermal and Moisture Protection	Add/Deduct	$________
Alternate No. 4.	Finishes	Add/Deduct	$________
Alternate No. 5.	Equipment	Add/Deduct	$________
Alternate No. 6.	Plumbing and Fire Protection	Add/Deduct	$________

4. Contract Documents. The term "Contract Documents" means and includes the following:

(A) This Agreement;
(B) General Conditions of the Contract for Construction (AIA A201, 1976 Edition);
(C) Supplementary General Conditions;
(D) Boston Resident Jobs Policy;
(E) MHFA Equal Opportunity/Affirmative Action Contract for Construction;
(F) City of Boston Compliance Contract Supplement;
(G) Payment Bond;
(H) Performance Bond;
(I) Lien Bond;
(J) Notice to Proceed;
(K) Modifications (as defined in the General Conditions);
(L) Drawings entitled "Roxbury Corners Housing" prepared by CPF/Domenech & Hicks, Inc., Architects and its consultants and listed as follows:

Designation	Latest Revision

(M) Specifications entitled "Roxbury Corners Housing: prepared by CPF/Domenech & Hicks, Inc., and its consultants, dated ____________, and consisting of Division __ through Division __.

(N) The following Addenda:
No. __________, dated ______________.
(O) Transportation Access Plan
(P) MHFA Addendum #1

5. Progress Payments. Progress payments shall be made based upon Applications for Payment for each calendar month, which shall be submitted by Contractor to Architect on AIA Form G702 and 703, and upon the Certificates for Payment issued by the Architect. An Application for Payment shall be submitted on or after the last day of each month for all work in place as of the last day of the month. Within ten working days of receipt of the fully completed Application of Payment by Architect, Owner, Owner's lender, and Owner's lender's consulting engineer and upon approval by Owner's lender, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided in the Contract Documents as follows: ninety percent (90%) of the portion of the Contract Sum properly allocable to labor, materials, and equipment incorporated into the Work (and also including Contractor's overhead and profit allocable thereto) and ninety-percent (90%) of the portion of the Contract Sum properly allocable to materials and equipment suitably stored at the site or at some other location agreed upon in writing, to the extent agreed to by Owner's mortgagee, for the period covered by the Application for Payment, less the aggregate of previous payments made by the Owner. Upon completion of 50% of the Work, the payment amount shall be increased to 95% of the properly allocable amounts, provided that Contractor is not then in default on its obligations hereunder and approved by lender. All amounts payable on account of stored materials not yet incorporated in the Work shall be limited to Contractor's actual out-of-pocket costs for such materials.

6. Final Payment. Final Payment shall be due forty-five (45) days after Final Completion of the Work as defined in Subparagraph 8.1.1 of the Supplementary General Conditions provided (i) the Work be then fully completed and this Contract fully performed (subject, however, to a "punch list" of minor uncompleted or uncorrected items which do not interfere with Owner's use and enjoyment of the premises, and with respect to which Owner shall withhold 200% of the reasonable cost of fully completing same as determined by Architect), (ii) the Architect has issued a final Certificate for Payment, (iii) there have been delivered releases from or acceptable assurances of payment to all subcontractors and materialmen, which releases and assurances shall cover all work, labor and materials, including equipment and fixtures of all kinds, done, performed or furnished for the Project, and (iv) Owner's lender has approved such payment. No payment under this Contract is intended nor shall it be construed as evidence of performance of this Contract, either in whole or in part, and no payment including the Final Payment shall be construed to be an acceptance of defective work or improper materials. Notwithstanding anything to the contrary in this Agreement, Final Payment shall not be payable unless the Project complies with all applicable state and local building codes for the rehabilitation of existing buildings, and, if applicable, the City of Boston issues certificates permitting occupancy of the Project.

7. Agreement Binding. This Agreement shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns.

8. Financing Approval. The Owner shall use its best efforts to obtain construction financing and to reach loan closing in a timely fashion, meeting the lender's terms, conditions and requirements for closing. If the Owner, despite its best efforts, is unable to so reach loan closing by ___________, 1989, either party may, by written notice to the other prior to issuance of the Notice to Proceed, terminate this Agreement, which shall thereupon be void and of no further force or effect and neither party shall have further recourse hereunder.

9. Assignment of the Contract. Owner may not assign its interest under this Contract, except to an affiliate of the Owner, without prior written consent of the Contractor. Notwithstanding the foregoing sentence, the Contractor hereby consents to the Owner's assignment of its interest in the Contract to the mortgagees or other institutions providing financing for this Work. In addition, the Contractor agrees to facilitate any such assignment by providing the assignees with any documents they reasonably request.

10. Lender Requirements. The Contractor agrees to provide reasonable assistance to Owner in fulfilling Owner's obligations to provide information to Lender under its loan documents.

IN WITNESS WHEREOF, the parties hereto have executed or caused to be executed by their duly authorized officials this Agreement, under seal, on the date first above written.

OWNER:

____

By: ____________________________________

Address: _______________________________

CONTRACTOR:

____

By: ____________________________________

Address: _______________________________

License No.

0661c

Exhibit A

Base Contract Sum
Schedule of Values **

	Item	Value
1.	General Conditions	$______
2.	Demolition	$______
3.	Site Work	$______
4.	Concrete	$______
5.	Concrete Repair/Waterproofing	$______
6.	Glass Fibre Reinforced Concrete	$______
7.	Masonry	$______
8.	Masonry Repair/Waterproofing	$______
9.	Structural Steel & Misc. Metals	$______
10.	Cutting, Patching, Coring	$______
11.	Rough Carpentry	$______
12.	Finish Carpentry and Mill Work, Incl. Wood Doors	$______
13.	Waterproofing & Damp Proofing	$______
14.	Building Insulation	$______
15.	Roofing and Sheet Metal Work, Incl. penthouse sid.	$______
16.	Sealants	$______
17.	Metal Doors & Frames	$______
18.	Overhead Doors	$______
19.	Fire proofing	$______
20.	Aluminum Entrances, Frames, Glass, Windows	$______
21.	Finish Hardware	$______
22.	Drywall	$______
23.	Tile	$______
24.	Acoustic Ceilings	$______
25.	Resilient Flooring	$______
26.	Carpet (incl. alternate)	$______
27.	Painting	$______
28.	Painting Exterior Concrete	$______
29.	Toilet Partitions & Accessories	$______
30.	Parking & Loading Equipment	$______
31.	Vertical Blinds	$______
32.	Elevators	$______
33.	Plumbing	$______
34.	Fire Protection	$______
35.	HVAC	$______
36.	Electrical	$______
37.	Misc. Specialties	$______
	Total Sub-Contract Cost	$______
	Overhead & Profit	$______
	Total Base Contract Sum	$______

*The listing of scheduled values is intended for purposes of progress payments and does not relieve the Contractor from the requirement to provide all work indicated in Contract Documents or required to complete same.

THE AMERICAN INSTITUTE OF ARCHITECTS

AIA Document A201

General Conditions of the Contract for Construction

THIS DOCUMENT HAS IMPORTANT LEGAL CONSEQUENCES; CONSULTATION WITH AN ATTORNEY IS ENCOURAGED WITH RESPECT TO ITS MODIFICATION

1976 EDITION

TABLE OF ARTICLES

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3. OWNER
4. CONTRACTOR
5. SUBCONTRACTORS
6. WORK BY OWNER OR BY SEPARATE CONTRACTORS
7. MISCELLANEOUS PROVISIONS
8. TIME
9. PAYMENTS AND COMPLETION
10. PROTECTION OF PERSONS AND PROPERTY
11. INSURANCE
12. CHANGES IN THE WORK
13. UNCOVERING AND CORRECTION OF WORK
14. TERMINATION OF THE CONTRACT

This document has been approved and endorsed by The Associated General Contractors of America.

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GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

ARTICLE 1

CONTRACT DOCUMENTS

1.1 DEFINITIONS

1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents consist of the Owner-Contractor Agreement, the Conditions of the Contract (General, Supplementary and other Conditions), the Drawings, the Specifications, and all Addenda issued prior to and all Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a written interpretation issued by the Architect pursuant to Subparagraph 2.2.8, or (4) a written order for a minor change in the Work issued by the Architect pursuant to Paragraph 12.4. The Contract Documents do not include Bidding Documents such as the Advertisement or Invitation to Bid, the Instructions to Bidders, sample forms, the Contractor's Bid or portions of Addenda relating to any of these, or any other documents, unless specifically enumerated in the Owner-Contractor Agreement.

1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. This Contract represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification as defined in Subparagraph 1.1.1. The Contract Documents shall not be construed to create any contractual relationship of any kind between the Architect and the Contractor, but the Architect shall be entitled to performance of obligations intended for his benefit, and to enforcement thereof. Nothing contained in the Contract Documents shall create any contractual relationship between the Owner or the Architect and any Subcontractor or Sub-subcontractor.

1.1.3 THE WORK

The Work comprises the completed construction required by the Contract Documents and includes all labor necessary to produce such construction, and all materials and equipment incorporated or to be incorporated in such construction.

1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part.

1.2 EXECUTION, CORRELATION AND INTENT

1.2.1 The Contract Documents shall be signed in not less than triplicate by the Owner and Contractor. If either the Owner or the Contractor or both do not sign the Conditions of the Contract, Drawings, Specifications, or any of the other Contract Documents, the Architect shall identify such Documents.

1.2.2 By executing the Contract, the Contractor represents that he has visited the site, familiarized himself with the local conditions under which the Work is to be performed, and correlated his observations with the requirements of the Contract Documents.

1.2.3 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work. The Contract Documents are complementary, and what is required by any one shall be as binding as if required by all. Work not covered in the Contract Documents will not be required unless it is consistent therewith and is reasonably inferable therefrom as being necessary to produce the intended results. Words and abbreviations which have well-known technical or trade meanings are used in the Contract Documents in accordance with such recognized meanings.

1.2.4 The organization of the Specifications into divisions, sections and articles, and the arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

1.3 OWNERSHIP AND USE OF DOCUMENTS

1.3.1 All Drawings, Specifications and copies thereof furnished by the Architect are and shall remain his property. They are to be used only with respect to this Project and are not to be used on any other project. With the exception of one contract set for each party to the Contract, such documents are to be returned or suitably accounted for to the Architect on request at the completion of the Work. Submission or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's common law copyright or other reserved rights.

ARTICLE 2

ARCHITECT

2.1 DEFINITION

2.1.1 The Architect is the person lawfully licensed to practice architecture, or an entity lawfully practicing architecture identified as such in the Owner-Contractor Agreement, and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Architect means the Architect or his authorized representative.

2.2 ADMINISTRATION OF THE CONTRACT

2.2.1 The Architect will provide administration of the Contract as hereinafter described.

2.2.2 The Architect will be the Owner's representative during construction and until final payment is due. The Architect will advise and consult with the Owner. The Owner's instructions to the Contractor shall be forwarded through the Architect. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified by written instrument in accordance with Subparagraph 2.2.18.

2.2.3 The Architect will visit the site at intervals appropriate to the stage of construction to familiarize himself generally with the progress and quality of the Work and to determine in general if the Work is proceeding in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. On the basis of his on-site observations as an architect, he will keep the Owner informed of the progress of the Work, and will endeavor to guard the Owner against defects and deficiencies in the Work of the Contractor.

2.2.4 The Architect will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Work, and he will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Architect will not be responsible for or have control or charge over the acts or omissions of the Contractor, Subcontractors, or any of their agents or employees, or any other persons performing any of the Work.

2.2.5 The Architect shall at all times have access to the Work wherever it is in preparation and progress. The Contractor shall provide facilities for such access so the Architect may perform his functions under the Contract Documents.

2.2.6 Based on the Architect's observations and an evaluation of the Contractor's Applications for Payment, the Architect will determine the amounts owing to the Contractor and will issue Certificates for Payment in such amounts, as provided in Paragraph 9.4.

2.2.7 The Architect will be the interpreter of the requirements of the Contract Documents and the judge of the performance thereunder by both the Owner and Contractor.

2.2.8 The Architect will render interpretations necessary for the proper execution or progress of the Work, with reasonable promptness and in accordance with any time limit agreed upon. Either party to the Contract may make written request to the Architect for such interpretations.

2.2.9 Claims, disputes and other matters in question between the Contractor and the Owner relating to the execution or progress of the Work or the interpretation of the Contract Documents shall be referred initially to the Architect for decision which he will render in writing within a reasonable time.

2.2.10 All interpretations and decisions of the Architect shall be consistent with the intent of and reasonably inferable from the Contract Documents and will be in writing or in the form of drawings. In his capacity as interpreter and judge, he will endeavor to secure faithful performance by both the Owner and the Contractor, will not show partiality to either, and will not be liable for the result of any interpretation or decision rendered in good faith in such capacity.

2.2.11 The Architect's decisions in matters relating to artistic effect will be final if consistent with the intent of the Contract Documents.

2.2.12 Any claim, dispute or other matter in question between the Contractor and the Owner referred to the Architect, except those relating to artistic effect as provided in Subparagraph 2.2.11 and except those which have been waived by the making or acceptance of final payment as provided in Subparagraphs 9.9.4 and 9.9.5, shall be subject to arbitration upon the written demand of either party. However, no demand for arbitration of any such claim, dispute or other matter may be made until the earlier of (1) the date on which the Architect has rendered a written decision, or (2) the tenth day after the parties have presented their evidence to the Architect or have been given a reasonable opportunity to do so, if the Architect has not rendered his written decision by that date. When such a written decision of the Architect states (1) that the decision is final but subject to appeal, and (2) that any demand for arbitration of a claim, dispute or other matter covered by such decision must be made within thirty days after the date on which the party making the demand receives the written decision, failure to demand arbitration within said thirty days' period will result in the Architect's decision becoming final and binding upon the Owner and the Contractor. If the Architect renders a decision after arbitration proceedings have been initiated, such decision may be entered as evidence but will not supersede any arbitration proceedings unless the decision is acceptable to all parties concerned.

2.2.13 The Architect will have authority to reject Work which does not conform to the Contract Documents. Whenever, in his opinion, he considers it necessary or advisable for the implementation of the intent of the Contract Documents, he will have authority to require special inspection or testing of the Work in accordance with Subparagraph 7.7.2 whether or not such Work be then fabricated, installed or completed. However, neither the Architect's authority to act under this Subparagraph 2.2.13, nor any decision made by him in good faith either to exercise or not to exercise such authority, shall give rise to any duty or responsibility of the Architect to the Contractor, any Subcontractor, any of their agents or employees, or any other person performing any of the Work.

2.2.14 The Architect will review and approve or take other appropriate action upon Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for conformance with the design concept of the Work and with the information given in the Contract Documents. Such action shall be taken with reasonable promptness so as to cause no delay. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

2.2.15 The Architect will prepare Change Orders in accordance with Article 12, and will have authority to order minor changes in the Work as provided in Subparagraph 12.4.1.

2.2.16 The Architect will conduct inspections to determine the dates of Substantial Completion and final completion, will receive and forward to the Owner for the Owner's review written warranties and related documents required by the Contract and assembled by the Contractor, and will issue a final Certificate for Payment upon compliance with the requirements of Paragraph 9.9.

2.2.17 If the Owner and Architect agree, the Architect will provide one or more Project Representatives to assist the Architect in carrying out his responsibilities at the site. The duties, responsibilities and limitations of authority of any such Project Representative shall be as set forth in an exhibit to be incorporated in the Contract Documents.

2.2.18 The duties, responsibilities and limitations of authority of the Architect as the Owner's representative during construction as set forth in the Contract Documents will not be modified or extended without written consent of the Owner, the Contractor and the Architect.

2.2.19 In case of the termination of the employment of the Architect, the Owner shall appoint an architect against whom the Contractor makes no reasonable objection whose status under the Contract Documents shall be that of the former architect. Any dispute in connection with such appointment shall be subject to arbitration.

ARTICLE 3

OWNER

3.1 DEFINITION

3.1.1 The Owner is the person or entity identified as such in the Owner-Contractor Agreement and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Owner means the Owner or his authorized representative.

3.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

3.2.1 The Owner shall, at the request of the Contractor, at the time of execution of the Owner-Contractor Agreement, furnish to the Contractor reasonable evidence that he has made financial arrangements to fulfill his obligations under the Contract. Unless such reasonable evidence is furnished, the Contractor is not required to execute the Owner-Contractor Agreement or to commence the Work.

3.2.2 The Owner shall furnish all surveys describing the physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site.

3.2.3 Except as provided in Subparagraph 4.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for the construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

3.2.4 Information or services under the Owner's control shall be furnished by the Owner with reasonable promptness to avoid delay in the orderly progress of the Work.

3.2.5 Unless otherwise provided in the Contract Documents, the Contractor will be furnished, free of charge, all copies of Drawings and Specifications reasonably necessary for the execution of the Work.

3.2.6 The Owner shall forward all instructions to the Contractor through the Architect.

3.2.7 The foregoing are in addition to other duties and responsibilities of the Owner enumerated herein and especially those in respect to Work by Owner or by Separate Contractors, Payments and Completion, and Insurance in Articles 6, 9 and 11 respectively.

3.3 OWNER'S RIGHT TO STOP THE WORK

3.3.1 If the Contractor fails to correct defective Work as required by Paragraph 13.2 or persistently fails to carry out the Work in accordance with the Contract Documents, the Owner, by a written order signed personally or by an agent specifically so empowered by the Owner in writing, may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the Owner to stop the Work shall not give rise to any duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Subparagraph 6.1.3.

3.4 OWNER'S RIGHT TO CARRY OUT THE WORK

3.4.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within seven days after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, after seven days following receipt by the Contractor of an additional written notice and without prejudice to any other remedy he may have, make good such deficiencies. In such case an appropriate Change Order shall be issued deducting from the payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the Architect's additional services made necessary by such default, neglect or failure. Such action by the Owner and the amount charged to the Contractor are both subject to the prior approval of the Architect. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

ARTICLE 4

CONTRACTOR

4.1 DEFINITION

4.1.1 The Contractor is the person or entity identified as such in the Owner-Contractor Agreement and is referred to throughout the Contract Documents as if singular in number and masculine in gender. The term Contractor means the Contractor or his authorized representative.

4.2 REVIEW OF CONTRACT DOCUMENTS

4.2.1 The Contractor shall carefully study and compare the Contract Documents and shall at once report to the Architect any error, inconsistency or omission he may discover. The Contractor shall not be liable to the Owner or the Architect for any damage resulting from any such errors, inconsistencies or omissions in the Contract Documents. The Contractor shall perform no portion of the Work at any time without Contract Documents or, where required, approved Shop Drawings, Product Data or Samples for such portion of the Work.

4.3 SUPERVISION AND CONSTRUCTION PROCEDURES

4.3.1 The Contractor shall supervise and direct the Work, using his best skill and attention. He shall be solely responsible for all construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract.

4.3.2 The Contractor shall be responsible to the Owner for the acts and omissions of his employees, Subcontractors and their agents and employees, and other persons performing any of the Work under a contract with the Contractor.

4.3.3 The Contractor shall not be relieved from his obligations to perform the Work in accordance with the Contract Documents either by the activities or duties of the Architect in his administration of the Contract, or by inspections, tests or approvals required or performed under Paragraph 7.7 by persons other than the Contractor.

4.4 LABOR AND MATERIALS

4.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

4.4.2 The Contractor shall at all times enforce strict discipline and good order among his employees and shall not employ on the Work any unfit person or anyone not skilled in the task assigned to him.

4.5 WARRANTY

4.5.1 The Contractor warrants to the Owner and the Architect that all materials and equipment furnished under this Contract will be new unless otherwise specified, and that all Work will be of good quality, free from faults and defects and in conformance with the Contract Documents. All Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment. This warranty is not limited by the provisions of Paragraph 13.2.

4.6 TAXES

4.6.1 The Contractor shall pay all sales, consumer, use and other similar taxes for the Work or portions thereof provided by the Contractor which are legally enacted at the time bids are received, whether or not yet effective.

4.7 PERMITS, FEES AND NOTICES

4.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit and for all other permits and governmental fees, licenses and inspections necessary for the proper execution and completion of the Work which are customarily secured after execution of the Contract and which are legally required at the time the bids are received.

4.7.2 The Contractor shall give all notices and comply with all laws, ordinances, rules, regulations and lawful orders of any public authority bearing on the performance of the Work.

4.7.3 It is not the responsibility of the Contractor to make certain that the Contract Documents are in accordance with applicable laws, statutes, building codes and regulations. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, he shall promptly notify the Architect in writing, and any necessary changes shall be accomplished by appropriate Modification.

4.7.4 If the Contractor performs any Work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to the Architect, he shall assume full responsibility therefor and shall bear all costs attributable thereto.

4.8 ALLOWANCES

4.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by these allowances shall be supplied for such amounts and by such persons as the Owner may direct, but the Contractor will not be required to employ persons against whom he makes a reasonable objection.

4.8.2 Unless otherwise provided in the Contract Documents:

- **.1** these allowances shall cover the cost to the Contractor, less any applicable trade discount, of the materials and equipment required by the allowance delivered at the site, and all applicable taxes;
- **.2** the Contractor's costs for unloading and handling on the site, labor, installation costs, overhead, profit and other expenses contemplated for the original allowance shall be included in the Contract Sum and not in the allowance;
- **.3** whenever the cost is more than or less than the allowance, the Contract Sum shall be adjusted accordingly by Change Order, the amount of which will recognize changes, if any, in handling costs on the site, labor, installation costs, overhead, profit and other expenses.

4.9 SUPERINTENDENT

4.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during the progress of the Work. The superintendent shall represent the Contractor and all communications given to the superintendent shall be as binding as if given to the Contractor. Important communications shall be confirmed in writing. Other communications shall be so confirmed on written request in each case.

4.10 PROGRESS SCHEDULE

4.10.1 The Contractor, immediately after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information an estimated progress schedule for the Work. The progress schedule shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

4.11 DOCUMENTS AND SAMPLES AT THE SITE

4.11.1 The Contractor shall maintain at the site for the Owner one record copy of all Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to record all changes made during construction, and approved Shop Drawings, Product Data and Samples. These shall be available to the Architect and shall be delivered to him for the Owner upon completion of the Work.

4.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

4.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or any Subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

4.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate a material, product or system for some portion of the Work.

4.12.3 Samples are physical examples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

4.12.4 The Contractor shall review, approve and submit, with reasonable promptness and in such sequence as to cause no delay in the Work or in the work of the Owner or any separate contractor, all Shop Drawings, Product Data and Samples required by the Contract Documents.

4.12.5 By approving and submitting Shop Drawings, Product Data and Samples, the Contractor represents that he has determined and verified all materials, field measurements, and field construction criteria related thereto, or will do so, and that he has checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

4.12.6 The Contractor shall not be relieved of responsibility for any deviation from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data or Samples under Subparagraph 2.2.14 unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submission and the Architect has given written approval to the specific deviation. The Contractor shall not be relieved from responsibility for errors or omissions in the Shop Drawings, Product Data or Samples by the Architect's approval thereof.

4.12.7 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data or Samples, to revisions other than those requested by the Architect on previous submittals.

4.12.8 No portion of the Work requiring submission of a Shop Drawing, Product Data or Sample shall be commenced until the submittal has been approved by the Architect as provided in Subparagraph 2.2.14. All such portions of the Work shall be in accordance with approved submittals.

4.13 USE OF SITE

4.13.1 The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with any materials or equipment.

4.14 CUTTING AND PATCHING OF WORK

4.14.1 The Contractor shall be responsible for all cutting, fitting or patching that may be required to complete the Work or to make its several parts fit together properly.

4.14.2 The Contractor shall not damage or endanger any portion of the Work or the work of the Owner or any separate contractors by cutting, patching or otherwise altering any work, or by excavation. The Contractor shall not cut or otherwise alter the work of the Owner or any separate contractor except with the written consent of the Owner and of such separate contractor. The Contractor shall not unreasonably withhold from the Owner or any separate contractor his consent to cutting or otherwise altering the Work.

4.15 CLEANING UP

4.15.1 The Contractor at all times shall keep the premises free from accumulation of waste materials or rubbish caused by his operations. At the completion of the Work he shall remove all his waste materials and rubbish from and about the Project as well as all his tools, construction equipment, machinery and surplus materials.

4.15.2 If the Contractor fails to clean up at the completion of the Work, the Owner may do so as provided in Paragraph 3.4 and the cost thereof shall be charged to the Contractor.

4.16 COMMUNICATIONS

4.16.1 The Contractor shall forward all communications to the Owner through the Architect.

4.17 ROYALTIES AND PATENTS

4.17.1 The Contractor shall pay all royalties and license fees. He shall defend all suits or claims for infringement of any patent rights and shall save the Owner harmless from loss on account thereof, except that the Owner shall be responsible for all such loss when a particular design, process or the product of a particular manufacturer or manufacturers is specified, but if the Contractor has reason to believe that the design, process or product specified is an infringement of a patent, he shall be responsible for such loss unless he promptly gives such information to the Architect.

4.18 INDEMNIFICATION

4.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner and the Architect and their agents and employees from and against all claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from the performance of the Work, provided that any such claim, damage, loss or expense (1) is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself) including the loss of use resulting therefrom, and (2) is caused in whole or in part by any negligent act or omission of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or otherwise reduce any other right or obligation of indemnity which would otherwise exist as to any party or person described in this Paragraph 4.18.

4.18.2 In any and all claims against the Owner or the Architect or any of their agents or employees by any employee of the Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation under this Paragraph 4.18 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

4.18.3 The obligations of the Contractor under this Paragraph 4.18 shall not extend to the liability of the Architect, his agents or employees, arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, change orders, designs or specifications, or (2) the giving of or the failure to give directions or instructions by the Architect, his agents or employees provided such giving or failure to give is the primary cause of the injury or damage.

ARTICLE 5

SUBCONTRACTORS

5.1 DEFINITION

5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform any of the Work at the site. The term Subcontractor is referred to throughout the Contract Documents as if singular in number and masculine in gender and means a Subcontractor or his authorized representative. The term Subcontractor does not include any separate contractor or his subcontractors.

5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform any of the Work at the site. The term Sub-subcontractor is referred to throughout the Contract Documents as if singular in number and masculine in gender and means a Sub-subcontractor or an authorized representative thereof.

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

5.2.1 Unless otherwise required by the Contract Documents or the Bidding Documents, the Contractor, as soon as practicable after the award of the Contract, shall furnish to the Owner and the Architect in writing the names of the persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each of the principal portions of the Work. The Architect will promptly reply to the Contractor in writing stating whether or not the Owner or the Architect, after due investigation, has reasonable objection to any such proposed person or entity. Failure of the Owner or Architect to reply promptly shall constitute notice of no reasonable objection.

5.2.2 The Contractor shall not contract with any such proposed person or entity to whom the Owner or the Architect has made reasonable objection under the provisions of Subparagraph 5.2.1. The Contractor shall not be required to contract with anyone to whom he has a reasonable objection.

5.2.3 If the Owner or the Architect has reasonable objection to any such proposed person or entity, the Contractor shall submit a substitute to whom the Owner or the Architect has no reasonable objection, and the Contract Sum shall be increased or decreased by the difference in cost occasioned by such substitution and an appropriate Change Order shall be issued; however, no increase in the Contract Sum shall be allowed for any such substitution unless the Contractor has acted promptly and responsively in submitting names as required by Subparagraph 5.2.1.

5.2.4 The Contractor shall make no substitution for any Subcontractor, person or entity previously selected if the Owner or Architect makes' reasonable objection to such substitution.

5.3 SUBCONTRACTUAL RELATIONS

5.3.1 By an appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Documents, assumes toward the Owner and the Architect. Said agreement shall preserve and protect the rights of the Owner and the Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that the subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the Contractor-Subcontractor agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by these Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with his Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the Subcontract, copies of the Contract Documents to which the Subcontractor will be bound by this Paragraph 5.3, and identify to the Subcontractor any terms and conditions of the proposed Subcontract which may be at variance with the Contract Documents. Each Subcontractor shall similarly make copies of such Documents available to his Sub-subcontractors

ARTICLE 6

WORK BY OWNER OR BY SEPARATE CONTRACTORS

6.1 OWNER'S RIGHT TO PERFORM WORK AND TO AWARD SEPARATE CONTRACTS

6.1.1 The Owner reserves the right to perform work related to the Project with his own forces, and to award separate contracts in connection with other portions of the Project or other work on the site under these or similar Conditions of the Contract. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, he shall make such claim as provided elsewhere in the Contract Documents.

6.1.2 When separate contracts are awarded for different portions of the Project or other work on the site, the term Contractor in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

6.1.3 The Owner will provide for the coordination of the work of his own forces and of each separate contractor with the Work of the Contractor, who shall cooperate therewith as provided in Paragraph 6.2.

6.2 MUTUAL RESPONSIBILITY

6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for the introduction and storage of their materials and equipment and the execution of their work, and shall connect and coordinate his Work with theirs as required by the Contract Documents.

6.2.2 If any part of the Contractor's Work depends for proper execution or results upon the work of the Owner or any separate contractor, the Contractor shall, prior to proceeding with the Work, promptly report to the Architect any apparent discrepancies or defects in such other work that render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acceptance of the Owner's or separate contractors' work as fit and proper to receive his Work, except as to defects which may subsequently become apparent in such work by others.

6.2.3 Any costs caused by defective or ill-timed work shall be borne by the party responsible therefor.

6.2.4 Should the Contractor wrongfully cause damage to the work or property of the Owner, or to other work on the site, the Contractor shall promptly remedy such damage as provided in Subparagraph 10.2.5.

6.2.5 Should the Contractor wrongfully cause damage to the work or property of any separate contractor, the Contractor shall upon due notice promptly attempt to settle with such other contractor by agreement, or otherwise to resolve the dispute. If such separate contractor sues or initiates an arbitration proceeding against the Owner on account of any damage alleged to have been caused by the Contractor, the Owner shall notify the Contractor who shall defend such proceedings at the Owner's expense, and if any judgment or award against the Owner arises therefrom the Contractor shall pay or satisfy it and shall reimburse the Owner for all attorneys' fees and court or arbitration costs which the Owner has incurred.

6.3 OWNER'S RIGHT TO CLEAN UP

6.3.1 If a dispute arises between the Contractor and separate contractors as to their responsibility for cleaning up as required by Paragraph 4.15, the Owner may clean up and charge the cost thereof to the contractors responsible therefor as the Architect shall determine to be just.

ARTICLE 7

MISCELLANEOUS PROVISIONS

7.1 GOVERNING LAW

7.1.1 The Contract shall be governed by the law of the place where the Project is located.

7.2 SUCCESSORS AND ASSIGNS

7.2.1 The Owner and the Contractor each binds himself, his partners, successors, assigns and legal representatives to the other party hereto and to the partners, successors, assigns and legal representatives of such other party with respect to all covenants, agreements and obligations contained in the Contract Documents. Neither party to the Contract shall assign the Contract or sublet it as a whole without the written consent of the other, nor shall the Contractor assign any moneys due or to become due to him hereunder, without the previous written consent of the Owner.

7.3 WRITTEN NOTICE

7.3.1 Written notice shall be deemed to have been duly served if delivered in person to the individual or member of the firm or entity or to an officer of the corporation for whom it was intended, or if delivered at or sent by registered or certified mail to the last business address known to him who gives the notice.

7.4 CLAIMS FOR DAMAGES

7.4.1 Should either party to the Contract suffer injury or damage to person or property because of any act or omission of the other party or of any of his employees, agents or others for whose acts he is legally liable, claim shall be made in writing to such other party within a reasonable time after the first observance of such injury or damage.

7.5 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

7.5.1 The Owner shall have the right to require the Contractor to furnish bonds covering the faithful performance of the Contract and the payment of all obligations arising thereunder if and as required in the Bidding Documents or in the Contract Documents.

7.6 RIGHTS AND REMEDIES

7.6.1 The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder shall be in addition to and not a limitation of any duties, obligations, rights and remedies otherwise imposed or available by law.

7.6.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of any right or duty afforded any of them under the Contract, nor shall any such action or failure to act constitute an approval of or acquiescence in any breach thereunder, except as may be specifically agreed in writing

7.7 TESTS

7.7.1 If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any portion of the Work to be inspected, tested or approved, the Contractor shall give the Architect timely notice of its readiness so the Architect may observe such inspection, testing or approval. The Contractor shall bear all costs of such inspections, tests or approvals conducted by public authorities. Unless otherwise provided, the Owner shall bear all costs of other inspections, tests or approvals.

7.7.2 If the Architect determines that any Work requires special inspection, testing, or approval which Subparagraph 7.7.1 does not include, he will, upon written authorization from the Owner, instruct the Contractor to order such special inspection, testing or approval, and the Contractor shall give notice as provided in Subparagraph 7.7.1. If such special inspection or testing reveals a failure of the Work to comply with the requirements of the Contract Documents, the Contractor shall bear all costs thereof, including compensation for the Architect's additional services made necessary by such failure; otherwise the Owner shall bear such costs, and an appropriate Change Order shall be issued.

7.7.3 Required certificates of inspection, testing or approval shall be secured by the Contractor and promptly delivered by him to the Architect.

7.7.4 If the Architect is to observe the inspections, tests or approvals required by the Contract Documents, he will do so promptly and, where practicable, at the source of supply.

7.8 INTEREST

7.8.1 Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing at the place of the Project.

7.9 ARBITRATION

7.9.1 All claims, disputes and other matters in question between the Contractor and the Owner arising out of, or relating to, the Contract Documents or the breach thereof, except as provided in Subparagraph 2.2.11 with respect to the Architect's decisions on matters relating to artistic effect, and except for claims which have been waived by the making or acceptance of final payment as provided by Subparagraphs 9.9.4 and 9.9.5, shall be decided by arbitration in accordance with the Construction Industry Arbitration Rules of the American Arbitration Association then obtaining unless the parties mutually agree otherwise. No arbitration arising out of or relating to the Contract Documents shall include, by consolidation, joinder or in any other manner, the Architect, his employees or consultants except by written consent containing a specific reference to the Owner-Contractor Agreement and signed by the Architect, the Owner, the Contractor and any other person sought to be joined. No arbitration shall include by consolidation, joinder or in any other manner, parties other than the Owner, the Contractor and any other persons substantially involved in a common question of fact or law, whose presence is required if complete relief is to be accorded in the arbitration. No person other than the Owner or Contractor shall be included as an original third party or additional third party to an arbitration whose interest or responsibility is insubstantial. Any consent to arbitration involving an additional person or persons shall not constitute consent to arbitration of any dispute not described therein or with any person not named or described therein. The foregoing agreement to arbitrate and any other agreement to arbitrate with an additional person or persons duly consented to by the parties to the Owner-Contractor Agreement shall be specifically enforceable under the prevailing arbitration law. The award rendered by the arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

7.9.2 Notice of the demand for arbitration shall be filed in writing with the other party to the Owner-Contractor Agreement and with the American Arbitration Association, and a copy shall be filed with the Architect. The demand for arbitration shall be made within the time limits specified in Subparagraph 2.2.12 where applicable, and in all other cases within a reasonable time after the claim, dispute or other matter in question has arisen, and in no event shall it be made after the date when institution of legal or equitable proceedings based on such claim, dispute or other matter in question would be barred by the applicable statute of limitations.

7.9.3 Unless otherwise agreed in writing, the Contractor shall carry on the Work and maintain its progress during any arbitration proceedings, and the Owner shall continue to make payments to the Contractor in accordance with the Contract Documents.

ARTICLE 8

TIME

8.1 DEFINITIONS

8.1.1 Unless otherwise provided, the Contract Time is the period of time allotted in the Contract Documents for Substantial Completion of the Work as defined in Subparagraph 8.1.3, including authorized adjustments thereto.

8.1.2 The date of commencement of the Work is the date established in a notice to proceed. If there is no notice to proceed, it shall be the date of the Owner-Contractor Agreement or such other date as may be established therein.

8.1.3 The Date of Substantial Completion of the Work or designated portion thereof is the Date certified by the Architect when construction is sufficiently complete, in accordance with the Contract Documents, so the Owner can occupy or utilize the Work or designated portion thereof for the use for which it is intended.

8.1.4 The term day as used in the Contract Documents shall mean calendar day unless otherwise specifically designated.

8.2 PROGRESS AND COMPLETION

8.2.1 All time limits stated in the Contract Documents are of the essence of the Contract.

8.2.2 The Contractor shall begin the Work on the date of commencement as defined in Subparagraph 8.1.2. He shall carry the Work forward expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

8.3 DELAYS AND EXTENSIONS OF TIME

8.3.1 If the Contractor is delayed at any time in the progress of the Work by any act or neglect of the Owner or the Architect, or by any employee of either, or by any separate contractor employed by the Owner, or by changes ordered in the Work, or by labor disputes, fire, unusual delay in transportation, adverse weather conditions not reasonably anticipatable, unavoidable casualties, or any causes beyond the Contractor's control, or by delay authorized by the Owner pending arbitration, or by any other cause which the Architect determines may justify the delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

8.3.2 Any claim for extension of time shall be made in writing to the Architect not more than twenty days after the commencement of the delay; otherwise it shall be waived. In the case of a continuing delay only one claim is necessary. The Contractor shall provide an estimate of the probable effect of such delay on the progress of the Work.

8.3.3 If no agreement is made stating the dates upon which interpretations as provided in Subparagraph 2.2.8 shall be furnished, then no claim for delay shall be allowed on account of failure to furnish such interpretations until fifteen days after written request is made for them, and not then unless such claim is reasonable.

8.3.4 This Paragraph 8.3 does not exclude the recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9

PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

9.1.1 The Contract Sum is stated in the Owner-Contractor Agreement and, including authorized adjustments thereto, is the total amount payable by the Owner to the Contractor for the performance of the Work under the Contract Documents.

9.2 SCHEDULE OF VALUES

9.2.1 Before the first Application for Payment, the Contractor shall submit to the Architect a schedule of values allocated to the various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used only as a basis for the Contractor's Applications for Payment.

9.3 APPLICATIONS FOR PAYMENT

9.3.1 At least ten days before the date for each progress payment established in the Owner-Contractor Agreement, the Contractor shall submit to the Architect an itemized Application for Payment, notarized if required, supported by such data substantiating the Contractor's right to payment as the Owner or the Architect may require, and reflecting retainage, if any, as provided elsewhere in the Contract Documents.

9.3.2 Unless otherwise provided in the Contract Documents, payments will be made on account of materials or equipment not incorporated in the Work but delivered and suitably stored at the site and, if approved in advance by the Owner, payments may similarly be made for materials or equipment suitably stored at some other location agreed upon in writing. Payments for materials or equipment stored on or off the site shall be conditioned upon submission by the Contractor of bills of sale or such other procedures satisfactory to the Owner to establish the Owner's title to such materials or equipment or otherwise protect the Owner's interest, including applicable insurance and transportation to the site for those materials and equipment stored off the site.

9.3.3 The Contractor warrants that title to all Work, materials and equipment covered by an Application for Payment will pass to the Owner either by incorporation in the construction or upon the receipt of payment by the Contractor, whichever occurs first, free and clear of all liens, claims, security interests or encumbrances, hereinafter referred to in this Article 9 as "liens"; and that no Work, materials or equipment covered by an Application for Payment will have been acquired by the Contractor, or by any other person performing Work at the site or furnishing materials and equipment for the Project, subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or otherwise imposed by the Contractor or such other person.

9.4 CERTIFICATES FOR PAYMENT

9.4.1 The Architect will, within seven days after the receipt of the Contractor's Application for Payment, either issue a Certificate for Payment to the Owner, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor in writing his reasons for withholding a Certificate as provided in Subparagraph 9.6.1.

9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on his observations at the site as provided in Subparagraph 2.2.3 and the data comprising the Application for Payment, that the Work has progressed to the point indicated; that, to the best of his knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents (subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to the results of any subsequent tests required by or performed under the Contract Documents, to minor deviations from the Contract Documents correctable prior to completion, and to any specific qualifications stated in his Certificate); and that the Contractor is entitled to payment in the amount certified. However, by issuing a Certificate for Payment, the Architect shall not thereby be deemed to represent that he has made exhaustive or continuous on-site inspections to check the quality or quantity of the Work or that he has reviewed the construction means, methods, techniques, sequences or procedures, or that he has made any examination to ascertain how or for what purpose the Contractor has used the moneys previously paid on account of the Contract Sum.

9.5 PROGRESS PAYMENTS

9.5.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents.

9.5.2 The Contractor shall promptly pay each Subcontractor, upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's Work, the amount to which said Subcontractor is entitled, reflecting the percentage actually retained, if any, from payments to the Contractor on account of such Subcontractor's Work. The Contractor shall, by an appropriate agreement with each Subcontractor, require each Subcontractor to make payments to his Sub-subcontractors in similar manner.

9.5.3 The Architect may, on request and at his discretion, furnish to any Subcontractor, if practicable, information regarding the percentages of completion or the amounts applied for by the Contractor and the action taken thereon by the Architect on account of Work done by such Subcontractor.

9.5.4 Neither the Owner nor the Architect shall have any obligation to pay or to see to the payment of any moneys to any Subcontractor except as may otherwise be required by law.

9.5.5 No Certificate for a progress payment, nor any progress payment, nor any partial or entire use or occupancy of the Project by the Owner, shall constitute an acceptance of any Work not in accordance with the Contract Documents.

9.6 PAYMENTS WITHHELD

9.6.1 The Architect may decline to certify payment and may withhold his Certificate in whole or in part, to the extent necessary reasonably to protect the Owner, if in his opinion he is unable to make representations to the Owner as provided in Subparagraph 9.4.2. If the Architect is unable to make representations to the Owner as provided in Subparagraph 9.4.2 and to certify payment in the amount of the Application, he will notify the Contractor as provided in Subparagraph 9.4.1. If the Contractor and the Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which he is able to make such representations to the Owner. The Architect may also decline to certify payment or, because of subsequently discovered evidence or subsequent observations, he may nullify the whole or any part of any Certificate for Payment previously issued, to such extent as may be necessary in his opinion to protect the Owner from loss because of:

.1 defective Work not remedied,

.2 third party claims filed or reasonable evidence indicating probable filing of such claims,

.3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment,

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum,

.5 damage to the Owner or another contractor,

.6 reasonable evidence that the Work will not be completed within the Contract Time, or

.7 persistent failure to carry out the Work in accordance with the Contract Documents.

9.6.2 When the above grounds in Subparagraph 9.6.1 are removed, payment shall be made for amounts withheld because of them.

9.7 FAILURE OF PAYMENT

9.7.1 If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents any amount certified by the Architect or awarded by arbitration, then the Contractor may, upon seven additional days' written notice to the Owner and the Architect, stop the Work until payment of the amount owing has been received. The Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, which shall be effected by appropriate Change Order in accordance with Paragraph 12.3.

9.8 SUBSTANTIAL COMPLETION

9.8.1 When the Contractor considers that the Work, or a designated portion thereof which is acceptable to the Owner, is substantially complete as defined in Subparagraph 8.1.3, the Contractor shall prepare for submission to the Architect a list of items to be completed or corrected. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. When the Architect on the basis of an inspection determines that the Work or designated portion thereof is substantially complete, he will then prepare a Certificate of Substantial Completion which shall establish the Date of Substantial Completion, shall state the responsibilities of the Owner and the Contractor for security, maintenance, heat, utilities, damage to the Work, and insurance, and shall fix the time within which the Contractor shall complete the items listed therein. Warranties required by the Contract Documents shall commence on the Date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion. The Certificate of Substantial Completion shall be submitted to the Owner and the Contractor for their written acceptance of the responsibilities assigned to them in such Certificate.

9.8.2 Upon Substantial Completion of the Work or designated portion thereof and upon application by the Contractor and certification by the Architect, the Owner shall make payment, reflecting adjustment in retainage, if any, for such Work or portion thereof, as provided in the Contract Documents.

9.9 FINAL COMPLETION AND FINAL PAYMENT

9.9.1 Upon receipt of written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when he finds the Work acceptable under the Contract Documents and the Contract fully performed, he will promptly issue a final Certificate for Payment stating that to the best of his knowledge, information and belief, and on the basis of his observations and inspections, the Work has been completed in accordance with the terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor, and noted in said final Certificate, is due and payable. The Architect's final Certificate for Payment will constitute a further representation that the conditions precedent to the Contractor's being entitled to final payment as set forth in Subparagraph 9.9.2 have been fulfilled.

9.9.2 Neither the final payment nor the remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or his property might in any way be responsible, have been paid or otherwise satisfied, (2) consent of surety, if any, to final payment and (3), if required by the Owner, other data establishing payment or satisfaction of all such obligations, such as receipts, releases and waivers of liens arising out of the Contract, to the extent and in such form as may be designated by the Owner. If any Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify him against any such lien. If any such lien remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all moneys that the latter may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

9.9.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by the issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than the retainage stipulated in the Contract Documents, and if bonds have been furnished as provided in Paragraph 7.5, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

9.9.4 The making of final payment shall constitute a waiver of all claims by the Owner except those arising from:

- **.1** unsettled liens,
- **.2** faulty or defective Work appearing after Substantial Completion,
- **.3** failure of the Work to comply with the requirements of the Contract Documents, or
- **.4** terms of any special warranties required by the Contract Documents.

9.9.5 The acceptance of final payment shall constitute a waiver of all claims by the Contractor except those previously made in writing and identified by the Contractor as unsettled at the time of the final Application for Payment.

ARTICLE 10

PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

10.1.1 The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work.

10.2 SAFETY OF PERSONS AND PROPERTY

10.2.1 The Contractor shall take all reasonable precautions for the safety of, and shall provide all reasonable protection to prevent damage, injury or loss to:

- **.1** all employees on the Work and all other persons who may be affected thereby;
- **.2** all the Work and all materials and equipment to be incorporated therein, whether in storage on or off the site, under the care, custody or control of the Contractor or any of his Subcontractors or Sub-subcontractors; and
- **.3** other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

10.2.2 The Contractor shall give all notices and comply with all applicable laws, ordinances, rules, regulations and lawful orders of any public authority bearing on the safety of persons or property or their protection from damage, injury or loss.

10.2.3 The Contractor shall erect and maintain, as required by existing conditions and progress of the Work, all reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent utilities.

10.2.4 When the use or storage of explosives or other hazardous materials or equipment is necessary for the execution of the Work, the Contractor shall exercise the utmost care and shall carry on such activities under the supervision of properly qualified personnel.

10.2.5 The Contractor shall promptly remedy all damage or loss (other than damage or loss insured under Paragraph 11.3) to any property referred to in Clauses 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, any Subcontractor, any Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable and for which the Contractor is responsible under Clauses 10.2.1.2 and 10.2.1.3, except damage or loss attributable to the acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to his obligations under Paragraph 4.18.

10.2.6 The Contractor shall designate a responsible member of his organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and the Architect.

10.2.7 The Contractor shall not load or permit any part of the Work to be loaded so as to endanger its safety.

10.3 EMERGENCIES

10.3.1 In any emergency affecting the safety of persons or property, the Contractor shall act, at his discretion, to prevent threatened damage, injury or loss. Any additional compensation or extension of time claimed by the Contractor on account of emergency work shall be determined as provided in Article 12 for Changes in the Work.

ARTICLE 11

INSURANCE

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.1 The Contractor shall purchase and maintain such insurance as will protect him from claims set forth below which may arise out of or result from the Contractor's operations under the Contract, whether such operations be by himself or by any Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

.1 claims under workers' or workmen's compensation, disability benefit and other similar employee benefit acts;

.2 claims for damages because of bodily injury, occupational sickness or disease, or death of his employees;

.3 claims for damages because of bodily injury, sickness or disease, or death of any person other than his employees;

.4 claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the Contractor, or (2) by any other person;

.5 claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom; and

.6 claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

11.1.2 The insurance required by Subparagraph 11.1.1 shall be written for not less than any limits of liability specified in the Contract Documents, or required by law, whichever is greater.

11.1.3 The insurance required by Subparagraph 11.1.1 shall include contractual liability insurance applicable to the Contractor's obligations under Paragraph 4.18.

11.1.4 Certificates of Insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These Certificates shall contain a provision that coverages afforded under the policies will not be cancelled until at least thirty days' prior written notice has been given to the Owner.

11.2 OWNER'S LIABILITY INSURANCE

11.2.1 The Owner shall be responsible for purchasing and maintaining his own liability insurance and, at his option, may purchase and maintain such insurance as will protect him against claims which may arise from operations under the Contract.

11.3 PROPERTY INSURANCE

11.3.1 Unless otherwise provided, the Owner shall purchase and maintain property insurance upon the entire Work at the site to the full insurable value thereof. This insurance shall include the interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Work and shall insure against the perils of fire and extended coverage and shall include "all risk" insurance for physical loss or damage including, without duplication of coverage, theft, vandalism and malicious mischief. If the Owner does not intend to purchase such insurance for the full insurable value of the entire Work, he shall inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance which will protect the interests of himself, his Subcontractors and the Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by failure of the Owner to purchase or maintain such insurance and to so notify the Contractor, then the Owner shall bear all reasonable costs properly attributable thereto. If not covered under the all risk insurance or otherwise provided in the Contract Documents, the Contractor shall effect and maintain similar property insurance on portions of the Work stored off the site or in transit when such portions of the Work are to be included in an Application for Payment under Subparagraph 9.3.2.

11.3.2 The Owner shall purchase and maintain such boiler and machinery insurance as may be required by the Contract Documents or by law. This insurance shall include the interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Work.

11.3.3 Any loss insured under Subparagraph 11.3.1 is to be adjusted with the Owner and made payable to the Owner as trustee for the insureds, as their interests may appear, subject to the requirements of any applicable mortgagee clause and of Subparagraph 11.3.8. The Contractor shall pay each Subcontractor a just share of any insurance moneys received by the Contractor, and by appropriate agreement, written where legally required for validity, shall require each Subcontractor to make payments to his Sub-subcontractors in similar manner.

11.3.4 The Owner shall file a copy of all policies with the Contractor before an exposure to loss may occur.

11.3.5 If the Contractor requests in writing that insurance for risks other than those described in Subparagraphs 11.3.1 and 11.3.2 or other special hazards be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

11.3.6 The Owner and Contractor waive all rights against (1) each other and the Subcontractors, Sub-subcontractors, agents and employees each of the other, and (2) the Architect and separate contractors, if any, and their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other perils to the extent covered by insurance obtained pursuant to this Paragraph 11.3 or any other property insurance applicable to the Work, except such rights as they may have to the proceeds of such insurance held by the Owner as trustee. The foregoing waiver afforded the Architect, his agents and employees shall not extend to the liability imposed by Subparagraph 4.18.3. The Owner or the Contractor, as appropriate, shall require of the Architect, separate contractors, Subcontractors and Sub-subcontractors by appropriate agreements, written where legally required for validity, similar waivers each in favor of all other parties enumerated in this Subparagraph 11.3.6.

11.3.7 If required in writing by any party in interest, the Owner as trustee shall, upon the occurrence of an insured loss, give bond for the proper performance of his duties. He shall deposit in a separate account any money so received, and he shall distribute it in accordance with such agreement as the parties in interest may reach, or in accordance with an award by arbitration in which case the procedure shall be as provided in Paragraph 7.9. If after such loss no other special agreement is made, replacement of damaged work shall be covered by an appropriate Change Order.

11.3.8 The Owner as trustee shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within five days after the occurrence of loss to the Owner's exercise of this power, and if such objection be made, arbitrators shall be chosen as provided in Paragraph 7.9. The Owner as trustee shall, in that case, make settlement with the insurers in accordance with the directions of such arbitrators. If distribution of the insurance proceeds by arbitration is required, the arbitrators will direct such distribution.

11.3.9 If the Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion thereof, such occupancy or use shall not commence prior to a time mutually agreed to by the Owner and Contractor and to which the insurance company or companies providing the property insurance have consented by endorsement to the policy or policies. This insurance shall not be cancelled or lapsed on account of such partial occupancy or use. Consent of the Contractor and of the insurance company or companies to such occupancy or use shall not be unreasonably withheld.

11.4 LOSS OF USE INSURANCE

11.4.1 The Owner, at his option, may purchase and maintain such insurance as will insure him against loss of use of his property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of his property, including consequential losses due to fire or other hazards however caused, to the extent covered by insurance under this Paragraph 11.4.

ARTICLE 12

CHANGES IN THE WORK

12.1 CHANGE ORDERS

12.1.1 A Change Order is a written order to the Contractor signed by the Owner and the Architect, issued after execution of the Contract, authorizing a change in the Work or an adjustment in the Contract Sum or the Contract Time. The Contract Sum and the Contract Time may be changed only by Change Order. A Change Order signed by the Contractor indicates his agreement therewith, including the adjustment in the Contract Sum or the Contract Time.

12.1.2 The Owner, without invalidating the Contract, may order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and the Contract Time being adjusted accordingly. All such changes in the Work shall be authorized by Change Order, and shall be performed under the applicable conditions of the Contract Documents.

12.1.3 The cost or credit to the Owner resulting from a change in the Work shall be determined in one or more of the following ways:

.1 by mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;

.2 by unit prices stated in the Contract Documents or subsequently agreed upon;

.3 by cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or

.4 by the method provided in Subparagraph 12.1.4.

12.1.4 If none of the methods set forth in Clauses 12.1.3.1, 12.1.3.2 or 12.1.3.3 is agreed upon, the Contractor, provided he receives a written order signed by the Owner, shall promptly proceed with the Work involved. The cost of such Work shall then be determined by the Architect on the basis of the reasonable expenditures and savings of those performing the Work attributable to the change, including, in the case of an increase in the Contract Sum, a reasonable allowance for overhead and profit. In such case, and also under Clauses 12.1.3.3 and 12.1.3.4 above, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data for inclusion in a Change Order. Unless otherwise provided in the Contract Documents, cost shall be limited to the following: cost of materials, including sales tax and cost of delivery; cost of labor, including social security, old age and unemployment insurance, and fringe benefits required by agreement or custom; workers' or workmen's compensation insurance; bond premiums; rental value of equipment and machinery; and the additional costs of supervision and field office personnel directly attributable to the change. Pending final determination of cost to the Owner, payments on account shall be made on the Architect's Certificate for Payment. The amount of credit to be allowed by the Contractor to the Owner for any deletion or change which results in a net decrease in the Contract Sum will be the amount of the actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in any one change, the allowance for overhead and profit shall be figured on the basis of the net increase, if any, with respect to that change.

12.1.5 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if the quantities originally contemplated are so changed in a proposed Change Order that application of the agreed unit prices to the quantities of Work proposed will cause substantial inequity to the Owner or the Contractor, the applicable unit prices shall be equitably adjusted.

12.2 CONCEALED CONDITIONS

12.2.1 Should concealed conditions encountered in the performance of the Work below the surface of the ground or should concealed or unknown conditions in an existing structure be at variance with the conditions indicated by the Contract Documents, or should unknown physical conditions below the surface of the ground or should concealed or unknown conditions in an existing structure of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this Contract, be encountered, the Contract Sum shall be equitably adjusted by Change Order upon claim by either party made within twenty days after the first observance of the conditions.

12.3 CLAIMS FOR ADDITIONAL COST

12.3.1 If the Contractor wishes to make a claim for an increase in the Contract Sum, he shall give the Architect written notice thereof within twenty days after the occurrence of the event giving rise to such claim. This notice shall be given by the Contractor before proceeding to execute the Work, except in an emergency endangering life or property in which case the Contractor shall proceed in accordance with Paragraph 10.3. No such claim shall be valid unless so made. If the Owner and the Contractor cannot agree on the amount of the adjustment in the Contract Sum, it shall be determined by the Architect. Any change in the Contract Sum resulting from such claim shall be authorized by Change Order.

12.3.2 If the Contractor claims that additional cost is involved because of, but not limited to, (1) any written interpretation pursuant to Subparagraph 2.2.8, (2) any order by the Owner to stop the Work pursuant to Paragraph 3.3 where the Contractor was not at fault, (3) any written order for a minor change in the Work issued pursuant to Paragraph 12.4, or (4) failure of payment by the Owner pursuant to Paragraph 9.7, the Contractor shall make such claim as provided in Subparagraph 12.3.1.

12.4 MINOR CHANGES IN THE WORK

12.4.1 The Architect will have authority to order minor changes in the Work not involving an adjustment in the Contract Sum or an extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order, and shall be binding on the Owner and the Contractor. The Contractor shall carry out such written orders promptly.

ARTICLE 13

UNCOVERING AND CORRECTION OF WORK

13.1 UNCOVERING OF WORK

13.1.1 If any portion of the Work should be covered contrary to the request of the Architect or to requirements specifically expressed in the Contract Documents, it must, if required in writing by the Architect, be uncovered for his observation and shall be replaced at the Contractor's expense.

13.1.2 If any other portion of the Work has been covered which the Architect has not specifically requested to observe prior to being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work be found in accordance with the Contract Documents, the cost of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner. If such Work be found not in accordance with the Contract Documents, the Contractor shall pay such costs unless it be found that this condition was caused by the Owner or a separate contractor as provided in Article 6, in which event the Owner shall be responsible for the payment of such costs.

13.2 CORRECTION OF WORK

13.2.1 The Contractor shall promptly correct all Work rejected by the Architect as defective or as failing to conform to the Contract Documents whether observed before or after Substantial Completion and whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such rejected Work, including compensation for the Architect's additional services made necessary thereby.

13.2.2 If, within one year after the Date of Substantial Completion of the Work or designated portion thereof or within one year after acceptance by the Owner of designated equipment or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of a written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. This obligation shall survive termination of the Contract. The Owner shall give such notice promptly after discovery of the condition.

13.2.3 The Contractor shall remove from the site all portions of the Work which are defective or non-conforming and which have not been corrected under Subparagraphs 4.5.1, 13.2.1 and 13.2.2, unless removal is waived by the Owner.

13.2.4 If the Contractor fails to correct defective or nonconforming Work as provided in Subparagraphs 4.5.1, 13.2.1 and 13.2.2, the Owner may correct it in accordance with Paragraph 3.4.

13.2.5 If the Contractor does not proceed with the correction of such defective or non-conforming Work within a reasonable time fixed by written notice from the Architect, the Owner may remove it and may store the materials or equipment at the expense of the Contractor. If the Contractor does not pay the cost of such removal and storage within ten days thereafter, the Owner may upon ten additional days' written notice sell such Work at auction or at private sale and shall account for the net proceeds thereof, after deducting all the costs that should have been borne by the Contractor, including compensation for the Architect's additional services made necessary thereby. If such proceeds of sale do not cover all costs which the Contractor should have borne, the difference shall be charged to the Contractor and an appropriate Change Order shall be issued. If the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

13.2.6 The Contractor shall bear the cost of making good all work of the Owner or separate contractors destroyed or damaged by such correction or removal.

13.2.7 Nothing contained in this Paragraph 13.2 shall be construed to establish a period of limitation with respect to any other obligation which the Contractor might have under the Contract Documents, including Paragraph 4.5 hereof. The establishment of the time period of one year after the Date of Substantial Completion or such longer period of time as may be prescribed by law or by the terms of any warranty required by the Contract Documents relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which his obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to his obligations other than specifically to correct the Work.

13.3 ACCEPTANCE OF DEFECTIVE OR NON-CONFORMING WORK

13.3.1 If the Owner prefers to accept defective or non-conforming Work, he may do so instead of requiring its removal and correction, in which case a Change Order will be issued to reflect a reduction in the Contract Sum where appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 14

TERMINATION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

14.1.1 If the Work is stopped for a period of thirty days under an order of any court or other public authority having jurisdiction, or as a result of an act of government, such as a declaration of a national emergency making materials unavailable, through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing any of the Work under a contract with the Contractor, or if the Work should be stopped for a period of thirty days by the Contractor because the Architect has not issued a Certificate for Payment as provided in Paragraph 9.7 or because the Owner has not made payment thereon as provided in Paragraph 9.7, then the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner payment for all Work executed and for any proven loss sustained upon any materials, equipment, tools, construction equipment and machinery, including reasonable profit and damages.

14.2 TERMINATION BY THE OWNER

14.2.1 If the Contractor is adjudged a bankrupt, or if he makes a general assignment for the benefit of his creditors, or if a receiver is appointed on account of his insolvency, or if he persistently or repeatedly refuses or fails, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper materials, or if he fails to make prompt payment to Subcontractors or for materials or labor, or persistently disregards laws, ordinances, rules, regulations or orders of any public authority having jurisdiction, or otherwise is guilty of a substantial violation of a provision of the Contract Documents, then the Owner, upon certification by the Architect that sufficient cause exists to justify such action, may, without prejudice to any right or remedy and after giving the Contractor and his surety, if any, seven days' written notice, terminate the employment of the Contractor and take possession of the site and of all materials, equipment, tools, construction equipment and machinery thereon owned by the Contractor and may finish the Work by whatever method he may deem expedient. In such case the Contractor shall not be entitled to receive any further payment until the Work is finished.

14.2.2 If the unpaid balance of the Contract Sum exceeds the costs of finishing the Work, including compensation for the Architect's additional services made necessary thereby, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or to the Owner, as the case may be, shall be certified by the Architect, upon application, in the manner provided in Paragraph 9.4, and this obligation for payment shall survive the termination of the Contract.

SUPPLEMENTARY GENERAL CONDITIONS
Modifying AIA A201 (1976 Edition)

Regarding
Roxbury Corners Housing Project

The "General Conditions of the Contract for Construction," AIA Document A-201, Thirteenth Edition, August, 1976, Articles 1 through 14 inclusive are a part of this Contract. The following supplements modify, delete and/or add to the General Conditions. Where any article, paragraph or subparagraph in the General Conditions is supplemented by one of the following paragraphs, the provisions of such article, paragraph, or subparagraph shall remain in effect and the supplemental provisions shall be considered as added thereto. Where any article, paragraph or subparagraph in the General Conditions is amended, voided or superseded by any of the following paragraphs, the provisions of such article, paragraph or subparagraph not so amended, voided or superseded shall remain in effect. Unless otherwise noted, provisions below which do not correspond to an existing provision of the General Conditions are to be inserted in the order indicated.

Article 1: Contract Documents

1.1.1 Delete the first sentence and replace with the following:

The Contract Documents shall consist of the Owner-Contractor Agreement, all items enumerated as Contract Documents therein, and all Modifications issued after execution of the Owner-Contract Agreement.

Add the following at the end of subparagraph 1.1.1:

In the event of a conflict among the Contract Documents, the Documents shall be construed according to the following priorities:

First Priority: Modifications (with later date having greater priority)
Second Priority: Owner-Contractor Agreement
Third Priority: Supplementary General Conditions
Fourth Priority: General Conditions of the Contract for Construction
Fifth Priority: Addenda to Specifications or Drawings (with later date having greater priority)
Sixth Priority: Specifications
Seventh Priority: Drawings (sometimes called Plans)

In drawings, large scale details shall govern small scale drawings. All indications or notations which apply to one of a number of similar situations, materials or processes shall be deemed to apply to all such situations, materials or processes wherever they appear in the Work, except where a contrary result is clearly indicated by the Contract Documents. In case of conflicts between drawings and specifications, or within either of the documents themselves, the work shall be done by the method of highest quality and greatest expense, unless otherwise specifically directed by the Architect upon request for interpretation by the Contractor.

1.2.3 Insert the following before the last sentence:

The Architect may, as he deems desirable, issue additional drawings or instructions indicating in greater detail the construction or design of the various parts of the Work reasonably inferable from the Contract Documents; such drawings or instructions may be effected by notice to the Contractor without contemporaneous agreements for any modification of the Contract Time or Contract Sum. If the Contractor claims additional cost or delay on account of such additional drawings or instructions, it shall give notice as provided in subparagraph 12.3.2.

1.2.5 (insert) 1.2.5 The Drawings are diagrammatic only, and are not intended to show the exact physical locations or configurations of work. Such work shall be installed to clear all obstructions, permit proper clearances for the work of other trades, and present an orderly appearance where exposed. Exact locations of fixtures and outlets shall be obtained from the Architect as provided in subparagraphs 4.2.1 and 4.2.2 before the Work is roughed in; defective work installed without such information from the Architect shall be relocated at the Contractor's expense.

1.2.6 (insert) 1.2.6 The Contractor must inspect the building and site to fully understand the existing conditions and intent of the Contract Documents. Owner agrees to allow Contractor access to the building and site prior to giving the Notice to Proceed so that Contractor may conduct examinations and tests to ascertain (a) the scope of asbestos removal work and (b) the scope of the work involved in the removal of underground oil tanks/existing oil tanks/oil spill removal and (c) the general conditions of building and site. Contract Documents have been prepared from building drawings and from field measurements and their complete accuracy is not assured. Any deviations noticed by the Contractor affecting the work must be brought to the attention of the Architect before proceeding with the Work. No claim for extra compensation or extension of time will be allowed on account of the Contractor's failure to estimate properly the quantities, location, and measurements of all items required to complete the Work.

1.2.7 (insert) 1.2.7 Where codes, standards, requirements and publications of public and private bodies are referred to in the Specifications, references shall be understood to be to the latest revision prior to the date of receiving bids, except where otherwise indicated.

1.2.8 (insert) 1.2.8 Where no explicit quality or standards for materials or workmanship are established for work, such work is to be of good quality for the intended use and consistent with the quality of the surrounding work and of the construction of the Project generally.

1.2.9 (insert) 1.2.9 All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, and used, in accordance with the manufacturer's written or printed directions and instructions unless otherwise indicated in the Contract Documents.

Article 2: Architect

2.2.2 Delete the first 3 sentences of subparagraph 2.2.2.

2.2.7 Insert "initial" before "interpreter"; insert a period after "Contract Documents"; and delete everything thereafter.

2.2.9 Delete entirely and insert the following:

2.2.9 All claims, disputes and other matters in question described in subparagraph 7.9.1, and for which claim is made before the final payment, shall be referred initially to the Architect for decision in accordance with Sections 2.2.10 through 2.2.12, which decision shall be rendered in writing.

2.2.10 Delete the words "and judge" in line 5.

2.2.11 Delete "Architect", and insert: "The Owner's decisions, based on consultation with the Architect.".

2.2.12 In lines 11-13, delete the words "the parties have presented their evidence to Architect or have been given a reasonable opportunity to do so", and insert the following:

the Architect receives a written request for a decision sent by registered or certified mail to the Architect and to the other party to this Agreement.

Add at the end:

This agreement to arbitrate shall be subject to Section 7.9 and shall terminate upon Final Payment.

Article 3: Owner

3.2.2 Delete entirely and insert the following:

3.2.2 The Owner shall furnish to the Contractor any information available to Owner concerning the location of utilities on the Project site. The Contractor is solely responsible for identifying and verifying the precise location of utilities on the Project site.

3.2.5 Delete entirely and insert the following:

3.2.5 Unless otherwise provided in the Contract Documents, the Contractor shall be furnished free of charge one (1) reproducible set of all Contract Documents. The Contractor's cost of reproducing, for use by the Subcontractors, all copies of the Contract Documents reasonably necessary for the execution of the Work shall be included in the Contract Sum.

3.3.1 Delete "repeatedly" in the 2nd line.

3.4.1 In lines 6 and 7, delete "after ten days following receipt by the Contractor an additional written notice" and insert "upon further written notice to Contractor."

Article 4: Contractor

4.2.1 Delete entirely and insert the following:

4.2.1 The Contractor represents that it has carefully inspected the Project, and has carefully studied and compared the Owner-Contractor Agreement, General Conditions of the Contract, Drawings, Specifications, and other Contract Documents and agrees that such documents appear, to the best of its knowledge as an experienced contractor, to contain all items necessary for the complete rehabilitation and construction of the Project in accordance with current building and similar codes. The Contractor shall promptly notify Architect and Owner of all errors, omissions, inconsistencies or other problems it may discover immediately upon discovery and before beginning the Work. All costs and delays caused by the failure of Contractor to promptly report such matters shall be borne by Contractor. Upon the receipt of any Change Order, the Contractor shall carefully study and compare the Drawings and Specifications as they relate to the work requested, and shall report to Architect and Owner any conflicts with such building and similar codes, or inconsistencies with other Project Documents.

4.2.2 (insert) 4.2.2 Field verification of existing conditions and dimensions indicated in the Contract Documents is specifically directed and required of the Contractor as a matter of course. The Contractor shall review plans and details of construction indicated in the Contract Documents, and adjust its work to conform to actual conditions.

4.2.3 (insert) 4.2.3 The Contractor shall give the Architect at least five working days notice of any additional design drawings, specifications, or instructions required to define the Work in greater detail, or to permit the proper progress of the Work.

4.2.4 (insert) 4.2.4 The Contractor shall not proceed with any Work not clearly and consistently defined in detail in the Contract Documents, but shall request additional drawings or instructions from the Architect as provided in subparagraph 4.2.3. If the Contractor proceeds with such Work without obtaining further drawings or instructions, he shall correct Work incorrectly done at its own expense, it shall be liable to the Owner for the other damages resulting from incorrectly proceeding with the Work.

4.3.4 (insert) 4.3.4 The Contractor shall cooperate with the Architect and all Subcontractors in maintaining the orderly and continuous progress of the Work, and shall give all proper and customary facilities to all trades.

4.3.5 (insert) 4.3.5 The Contractor shall attend weekly job meetings (and such other meetings as may be requested from time to time) with the Architect and such other persons as the Architect may from time to time wish to have present. The Contractor shall be represented by a principal, project manager, general superintendent or other authorized main office representative, if requested by the Owner or Architect, as well as by his own superintendent. An authorized representative of any subcontractor or sub-subcontractor shall attend such meetings if his presence is requested by the Architect. Such representatives shall be empowered to make binding commitments on all matters to be discussed at such meetings, including costs, payments, change orders, time schedules, and manpower. Any notices required under the Contract may be served on such representatives.

4.4.2 (insert) 4.4.2 All work shall be applied and installed by workmen skilled and experienced in their respective trades, using proper tools and equipment. The Contractor shall ensure compliance by itself and all subcontractors with the prevailing wage requirements of MHFA which are in effect as of the date of construction start, and the Contractor shall, upon request, provide evidence of such compliance in a form satisfactory to the Owner, MHFA, and the City of Boston.

4.4.3 (insert) 4.4.3 During the course of construction, from the time the site is delivered to the Contractor until Substantial Completion, the Contractor shall make all necessary arrangements, including paying for all services for temporary water, heat and electrical power needed for the timely and proper completion of the Work by himself and all of his Subcontractors.

4.5.2 (insert) 4.5.2 If the Contractor proposes to use a material which, while suitable for the intended use, deviates in any way from the detailed requirements of the Contract Documents, it shall inform the Architect in writing of the nature of such deviations at the time the material is submitted for approval, and shall request written approval of the deviation from the requirements of the Contract Documents. The Owner and Architect will not approve as equal to materials specified proposed substitutes which, in their opinion, would be out of character, obtrusive, or otherwise inconsistent with the character or quality or design of the Work.

4.5.3 (insert) 4.5.3 Any additional cost, or any loss or damage arising from the substitution of any material or any method for those originally specified shall be borne by the Contractor, notwithstanding approval or acceptance of such substitution by the Owner or Architect, unless such substitution was made at the written request or direction of the Owner or the Architect, or was due to a change order required by public authority or unforeseen conditions as set forth in Article 12.

4.5.4 (insert) 4.5.4 The warranty provided in this paragraph 4.5 shall be in addition to and not in limitation of any other warranty required by the Contract Documents or otherwise prescribed by law.

4.5.5 (insert) 4.5.5 The Contractor shall procure and deliver to the Architect, no later than the date claimed by the Contractor as the date of Substantial Completion, bound together with a Table of Contents thereto, one set of all special warranties, endorsed by the Contractor, required by the Contract Documents. Delivery of the same by the Contractor shall constitute the Contractor's guarantee to the Owner that the warranty(s) shall be performed in accordance with its (their) terms and conditions.

4.5.6 (insert) 4.5.6 The Contractor shall be responsible for all broken, scratched or cracked glass, regardless of how caused, from the time the glazier has completed glazing until Substantial Completion.

4.7.1 Delete entirely and substitute the following:

4.7.1 The Contractor shall secure and pay for the street excavation permits, all utility company permits and fees, and all other permits and governmental fees, licenses and inspections necessary for the proper execution and completion of the Work and lawful use and occupancy of the Project, including permits for the removal and disposal of asbestos and asbestos contaminated materials, and the removal of underground/existing oil tanks/and oil spill removal from the premises. The Owner will procure and pay for the building and curb cut permits. The Contractor shall assist and cooperate with the Owner in such procurement.

4.7.2 Insert in the 2nd line after the word "regulations" the words "and permit conditions".

4.8.1 Add the following at the end:

These allowances shall cover the net cost of the materials and equipment delivered and unloaded at the site in designated storage areas, and all applicable taxes. The Contractor's handling costs on the site, labor, installation costs, overhead, profit and other expenses contemplated for the original allowance shall be included in the Contract Sum and not in the allowance, with the exception that for any allowance which is specified to include installation, this shall be done by the Contractor or by any subcontractor hired to do the work of the allowance and costs of such installation shall be included in the allowance.

4.9.1 Delete the first sentence of subparagraph 4.9.1 and substitute the following:

The Contractor shall employ a competent superintendent who shall be approved by the Owner. The superintendent shall be in attendance at the Project site full time during the progress of the Work until the date of Substantial Completion, and for such additional time thereafter as may be necessary for the expeditious completion of the Work.

4.9.2 (insert) 4.9.2 The Contractor shall properly verify existing conditions of the site and building grades, lines, levels, column, wall and partition lines required in laying out the Work. The Contractor shall compare all grades, lines, levels and dimensions as shown on the drawings with actual site conditions, and shall promptly report to the Architect, before commencing work, any inconsistencies he may discover.

4.9.3 (insert) 4.9.3 The Contractor shall coordinate and supervise the work performed by Subcontractors to the end that the Work is carried out without conflict between trades and so that no trade, at any time, causes delay to the general progress of the Work.

4.9.4 (insert) 4.9.4 The Contractor shall establish the building grades, lines, levels, column, wall and partition lines required by the various subcontractors in laying out their work.

4.10.1 Add at the end:

The progress schedule shall be updated as necessary from time to time. Failure to comply with the progress schedule shall be a default entitling Owner to its remedies under Article 14.

4.11.2 (insert) 4.11.2 The Architect may periodically inspect the record drawings at the site. The proper and current maintenance of the information required on these drawings shall be a condition precedent to approval of requisitions for periodic payment.

4.12.1 Delete entirely and substitute the following:

Shop Drawings are drawings, diagrams, illustrations, schedules, performance charts, and other data which are prepared by the Contractor, manufacturer, supplier, or distributor, and which illustrate some portion of the work. Printed brochures will not be accepted as a substitute for shop drawings, although they may be required separately or in addition to shop drawings. Shop drawings shall be submitted by Contractor in form of one reproducible sepia transparency and one blackline print per drawing and one printed brochure in packets of 3 copies each. In each case submittal shall be accompanied by a transmittal form describing the submittal. The Architect's criticisms and comments shall be made on the sepia copy which shall be returned to the Contractor. If resubmission is required by the Architect, the Contractor shall then promptly make the necessary corrections on the original drawing and resubmit a sepia transparency copy of the corrected drawing. Approval of shop drawings by the Architect and/or engineer is for general conformance to the Contract Documents and does not represent approval of dimensions, quantities, or methods of installation. The Contract Documents remain the controlling factor in case of disputes over installed items or work, and the Contractor shall replace any item or work which does not conform to the Contract Documents at its own expense.

4.12.3 Add the following at the end:

Samples shall be submitted in duplicate unless otherwise specified or directed by the Architect. Each sample shall be clearly labeled as to its material, type or make, manufacturer, size or gauge, and other pertinent data, as approved or directed by Architect.

4.12.5 Add the following sentence at the end:

The Contractor shall indicate this verification and approval of shop drawings submitted by a subcontractor by stamping all copies of the shop drawings prior to submittal to the Architect. Shop drawings submitted without the Contractor's stamp may be returned for re-submittal.

4.12.9 (insert) 4.12.9 The Contractor, immediately after being awarded the Contract, shall prepare and submit for the Architect's approval a schedule of shop drawings, printed brochures, and samples required to be submitted for the work. The schedule shall indicate by trade the date by which each such items is to be submitted and the date by which final approval of each item must be obtained, and shall be revised as required by conditions of the work, subject to Architect's approval. In each case reasonable time must be permitted for Architect's review and for possible resubmittals. Submission of shop drawings, printed brochures, and samples shall reasonably conform to the approved schedule.

4.13.2 (insert) 4.13.2 The Contractor shall be responsible for obtaining all necessary easements or permits for construction staging and for any use of public sidewalks or streets from the City of Boston or others, as necessary, and for furnishing and maintaining in a safe condition, all barricades, temporary enclosures, railings and lights and all other safety protection measures required by traffic, municipal and state safety regulations, and for removing the same on completion of the job. All such measures shall be in conformity with the Transportation Access Plan which has been prepared by the Owner and made available to the Contractor.

4.13.3 (insert) 4.13.3 All Work carried on outside of regular working hours shall be done at the Contractor's expense, and no extras will be allowed. The use of "overtime" shall be at the Contractor's sole and option and expense.

4.13.4 (insert) 4.13.4 The Contractor shall confine its apparatus, storage of materials, and operations of his workers to limits as required by the Architect, and shall not unreasonably encumber the premises with its materials. The Contractor shall keep the corridors and exits clear of debris, materials, etc. at all times, to provide for normal and fire egress from all buildings. The premises shall be maintained in a safe, orderly condition at all times.

The Contractor shall take the following precautions to protect and secure the Project and building materials:

(a) The Contractor shall maintain the site and buildings rubbish-free, and shall provide metal barrels into which all refuse shall be deposited. All such barrels shall have tight-fitting covers.

(b) The Contractor and Subcontractors shall store materials so they do not create natural pockets for papers or other combustible materials.

(c) When materials with combustible covers are stored on the site during construction, they shall be located within easy reach of fire protection equipment.

(d) An approved number of fire extinguishers shall be placed throughout the work areas, temporary paint shop and within easy reach of mechanics who are operating plumbers' furnaces, burning or welding apparatus. The number and location shall be approved from time to time by the local fire department, if so required.

(e) Every precaution shall be taken to see that all building materials and equipment and all parts of the buildings under construction are properly braced and secured against winds, protected from injury by water, fire, accident or other cause during work hours and non-working hours.

(f) The Contractor shall provide weather-tight and secure enclosures for all exterior openings in the buildings at all appropriate times.

(g) All damage to materials or completed work caused by the Contractor or its Subcontractors prior to Substantial Completion shall be replaced by the Contractor at no cost to the Owner.

(h) The Contractor shall keep all access roads and walks clear of construction equipment, materials, debris, and all other items. The Contractor shall be responsible for repairing all property that was damaged during construction, and shall leave it in as good as or better condition after completion as found before the Work started.

(i) The Contractor shall provide protection for all concrete and finished floors, treads, platforms and the like against mechanical damage, plaster droppings, oil, grease, paint or other materials that will stain the surface finish.

(j) Roofs and waterproof surfaces shall neither be subjected to traffic nor used for storage of materials. When these surfaces must be used, the Contractor shall provide large plywood sheets to protect them from damage.

(k) All temporary protection and coverings shall be removed at Final Completion.

(l) All temporary work shall be removed when it is no longer required. Prior to completion of the work, the Contractor shall remove all spots, stains, dirt and dust from all surfaces that were the result of the construction work. Before final completion, arrangements must be made with the Owner and the Architect to inspect the areas completed.

4.14.3 (insert) 4.14.3 Structural elements of the Work shall not be cut, patched, or otherwise altered or repaired without prior authorization issued by the Architect in writing except as required by the Drawings and Specifications or as approved by the structural engineer. Authorized operations involving structural elements of the Work shall be performed under the direct supervision of the Contractor. All Subcontractors involved in such operations shall be required to provide competent supervision of their respective phases of the Work.

4.15.1 Delete period at end, and add the following:

, and shall completely clean the premises, removing and disposing of all debris and rubbish, and cleaning all stains, spots, marks, dirt, mortar smears, plaster smears, paint smears, caulking smears, and other foreign materials from exposed surfaces inside and outside the new construction. When a building is turned over to the Owner, it shall be thoroughly clean and ready for immediate occupancy. Without limiting the generality of the above, the following specific work shall be done:

(a) Concrete and masonry shall be cleaned free of all foreign matter. If, in opinion of Architect, further cleaning of specific areas is required they shall be scrubbed with water or other cleaning agents. Acid cleaners will not be permitted, except as otherwise specifically called for.

(b) Glazed finishes shall be washed with clean water, mild soap, and soft rags, thoroughly rinsed, and then wiped with clean, soft white rags.

(c) Painted surfaces shall be cleaned free of all foreign matter and, if necessary, shall be lightly scrubbed at specific stains with clean water, mild soap, and soft rags, thoroughly rinsed, and then wiped with clean, soft white rags.

(d) Resilient flooring shall be given final cleaning and buffing.

(e) Architectural woodwork shall be thoroughly dusted and cleaned of all stains, spots, etc., using methods and cleaning agents previously approved by the Architect which will not damage the various finishes.

(f) Metal surfaces, hardware, fixtures, appliances, equipment and similar items shall be cleaned free of all foreign matter and, if necessary, shall be lightly scrubbed at specific stains with clean water, mild soap, and soft rags, thoroughly rinsed, and then wiped with clean, soft white rags.

(g) Glass mirrors, plastic and similar surfaces shall be thoroughly cleaned by professional window cleaners. All damaged, broken, or scratched items shall be replaced without cost of Owner.

4.18.1 In the 12th line after "omission", insert the words "or unreasonable delay".

4.18.4 4.18.4 Contractor hereby indemnifies and holds the Owner harmless from liability for injury to or death of any and all persons, including the Contractor's employees, and for any and all damage to property caused by, resulting from or arising out of any act, omission, or neglect on the part of the Contractor or of any Subcontractor or of anyone directly or indirectly employed by any of them, or of anyone for whose acts any of them may be liable in connection with operations under this contract.

Article 5: Subcontractors

5.1.3 (insert) 5.1.3 Nothing contained in the Contract Documents shall create any contractual relation between the Owner or the Architect and any Subcontractor or Sub-subcontractor.

5.2.1 Add the following at the end:

The Contractor at or before Substantial Completion shall provide the Owner with a list of all actual Subcontractors and suppliers of equipment and materials for the Work with the address and telephone number of each.

5.2.2 Add the following at the end:

Owner's objections may include concerns such as Minority/Female Business status, minority/female hiring and Owner's past experience with such Subcontractor.

5.3.2 (insert) 5.3.2 The Contractor shall require in its written contract with each Subcontractor that, in the event of any default by the Contractor under the Subcontract, or in the event of the termination of this Contract, the Owner shall have the right, but not the obligation, prior to termination of the Subcontract and after notice by the Subcontractor to the Owner of such default or, in the case of termination of this Contract, after notice by Owner to Subcontractor of such termination, to assume the Contractor's rights and obligations under the Subcontract arising after such notice. Owner shall have the right to review each subcontract to ensure compliance with this subparagraph.

5.3.3 (insert) 5.3.3 The Contractor shall require that each Subcontractor agree by his Subcontract to be joined in arbitration proceedings involving the Owner, the Contractor, the Architect, or any of them, relating to any Work covered by his Subcontractor, at the election of either the Owner or the Contractor. The Contractor shall require each Subcontractor to include a similar provision in his Sub-subcontracts.

The Contractor shall procure materials from such sources and shall manage his own forces and the forces of his Subcontractors and Sub-subcontractors in such a manner as will result in tranquil relations on the job site. The Contractor shall employ, and shall require his Subcontractors to employ, men and women on the Work who will at all times work in tranquility with others engaged in the Work. Should the Work for any reason be stopped or materially delayed, in the reasonable judgment of the Owner, due to a labor dispute involving the employees of, or directed at, any Subcontractor or any of his Sub-subcontractors, the Owner shall have the right to require the Contractor, to the extent Contractor is legally able to do so, to substitute a Subcontractor acceptable to the Owner.

Contractor shall require each Subcontractor to agree by its Subcontract to be bound by the provisions of this Subparagraph. Nothing in this Subparagraph shall create any third party beneficiary relationship between the Owner and the Subcontractor.

Article 6: Work by Owner or by Separate Contractors

6.2.5 Delete the words "Owner's expense" in the 9th line, and substitute "Contractor's expense with counsel acceptable to Owner."

Article 7: Miscellaneous Provisions

7.1.2 (insert) 7.1.2 Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included herein, and if through mistake or otherwise any such provision is not inserted, or its not correctly inserted, then upon the application of either party the contract shall forthwith be physically amended to make such insertion or correction.

7.2.2 (insert) 7.2.2 Owner shall have the right to assign this Contract to mortgage lenders as further security for such mortgage loans, and the Contractor shall sign all documents reasonably required by such mortgage lenders to evidence acknowledgement of assignment.

7.2.3 (insert) 7.2.3 If, after making Final Payment, the Owner conveys to a third party any building or other improvement constructed under the Contract, any rights which the Owner may have against the Contractor for maintenance service and for claims which, under the terms of subparagraph 9.9.4, are reserved to the Owner after the making and acceptance of final payment, shall automatically transfer to such third party.

7.4.2 (insert) 7.4.2 No consent or waiver, express or implied, by the Owner, the Contractor or the Architect to, or of, any breach of any covenant, condition of duty of the Owner, Architect or Contractor shall be construed to be a waiver of, or consent to, any other breach of the same or any other covenant, condition or duty.

7.5.1 Delete entirely and substitute the following:

7.5.1 The Contractor shall furnish, in form and substance satisfactory to the Owner and to Owner's lenders bonds (1) covering the faithful performance of the Contract, (2) the payment of all obligations arising hereunder, and (3) preventing the creation of any mechanics' or materialmens' liens under M.G.L. c.254. Each such bond shall be in dual or triple obligee form, as requested by Owner, and shall be for the Contract Sum from the commencement of the Work until one year after Final Completion. The performance bond shall survive acceptance of the Work by the Owner to the extent of guaranteeing Contractor's performance under paragraph 4.5 and paragraph 13.2.

7.5.2 (insert) 7.5.2 If, at any time after execution and approval of a bond required by the Contract Documents, the Owner shall deem any sureties upon such bond to be unsatisfactory, or if, for any reasons, such bond shall cease to be adequate security for the Owner, the Contractor shall, within five (5) days after notice to do so, furnish a new or additional bond, in form, sum and signed by such sureties as shall be satisfactory to the Owner. No further payment shall be deemed due nor shall any further payment be made to the Contractor unless and until such new or additional bond shall be furnished and approved. The premium on all bonds shall be paid by the Contractor.

7.7.3 Delete entirely and substitute the following:

7.7.3 Certificates of occupancy (as applicable) and certificates of inspection, testing and approval, including operating permits for any mechanical apparatus, such as boilers and air compressors, which may be required to permit full use and occupancy of the premises by the Owner and tenants shall be secured and paid for by the Contractor and promptly delivered to the Architect. This shall be a condition precedent to Substantial Completion of the Work. Architect's or any engineer's services required to obtain such certificates, permits, or approvals shall be paid for by the Contractor.

7.9.4 (insert) 7.9.4 Subparagraphs 2.2.7 - 2.2.13 and 7.9.1 - 7.9.3 of the General Conditions provide for the resolution of all disputes and claims between the Owner and Contractor by arbitration. Notwithstanding the referenced subparagraphs:

(a) In the event of either a monetary dispute of $50,000 or more (including a dispute initiated by a Subcontractor or a material vendor selling directly to the Contractor) or claims or counterclaims of one party in excess of $50,000, then such dispute or claims shall be resolved by arbitration only if the Owner and the Contractor agree to submit the matter to arbitration in accordance with the Contract Documents.

(b) If the Owner or the Contractor do not agree to submit a claim or dispute described in (a) above to arbitration, then the arbitration provisions of the Contract Documents shall not be applicable to that dispute, and either party shall be entitled to commence and prosecute litigation in a court of competent jurisdiction.

(c) It is further understood that any such monetary dispute or claims of $50,000 or less and all noneconomic disputes and claims shall be resolved by arbitration.

If a party institutes litigation under this Subparagraph 7.9.4, and a judgment is entered in those proceedings for less than $50,000, the court may assess all or part of the costs of litigation against the party who asserted the claim, if the court specifically finds that the amount of the claim was inflated to avoid arbitration, was frivolous, or was otherwise not made in good faith.

7.10 (insert) USE AND OCCUPANCY PRIOR TO SUBSTANTIAL COMPLETION

7.10.1 It is the intent of the Owner to occupy and use each of the completed triplex buildings as they are completed in order to minimize the risk of vandalism and theft. Therefore, prior to the date of Substantial Completion of the Work as stipulated in the Agreement, the Owner shall have the right to occupy and use completed triplex buildings. The Owner and Contractor shall determine the time, location, and extent of occupancy.

7.10.2 Use and occupancy prior to Final Completion shall not relieve the Contractor of his responsibility to maintain Contractor's Liability Insurance as required in Article 11 of the General Conditions.

7.10.3 Notwithstanding total or partial occupancy, the one-year guarantee period called for by the Contract Documents shall not commence until Final Completion.

Article 8: Time

8.1.1 Add the following at the end:

The parties agree that the Contract Time as hereinabove defined shall be the date of completion and time for performance for the purpose of Chapter 254 of the Massachusetts General Laws, unless an earlier date for completion has been specified in the contract of the person asserting any rights under Chapter 254. The Date of Final Completion of the Work or designated portion thereof is the date certified by the Architect under Subparagraph 9.9.1 when the Work is acceptable under the Contract Documents and the Contract has been fully performed.

8.1.3 Delete the period at the end, and add the following:

, and any remaining Work is minor and can be completed within 30 days and will not interfere with the Owner's use and occupancy of the building. The Contractor shall secure and deliver to the Architect a certificate of occupancy as a condition precedent to Substantial Completion.

8.3.1 Delete entirely and substitute the following:

8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by any act, omission or neglect of the Owner or the Architect, or by an employee of either, or by a separate Contractor employed by the Owner, or by changes ordered in the Work, unavoidable casualties, or by labor disputes not directed specifically at Contractor or its Subcontractors, or by delay authorized by the Owner pending arbitration, then the Contract Time shall be extended by Change Order for such reasonable time not exceeding the length of such delay as the Architect may determine. No extension of time shall be granted because of normal or abnormal weather conditions. Such conditions shall be wholly at the risk of the Contractor, whether occurring within the time originally scheduled for completion or within the period of any extension granted. Any additional cost of operations or conditions shall be the responsibility of the Contractor. The Contractor shall use his best efforts to avoid all labor conflicts, especially those between union and nonunion employees. All direct and consequential losses due to labor disputes except those of a national, state, or city wide nature and not directed at Contractor or its Subcontractors shall be borne by the Contractor.

8.3.2 Delete the period at the end, and add the following:

and shall rearrange the sequence of construction where possible to reduce delay, adjusting and resubmitting the Progress Schedule under Paragraph 4.10

8.3.5 (insert) 8.3.5 The Contractor hereby agrees that it shall have no claim for damages of any kind on account of any delay in the commencement of the Work and/or any delay or suspension of any portion of the Work, whether such delay is caused by the Owner, the Architect, or otherwise. The Contractor acknowledges that his sole remedy for any such delay and/or suspension will be an extension of time as provided in this Article.

Article 9: Payments and Completion

9.2.1 Delete entirely and insert the following:

9.2.1 Attached to the Owner-Contract Agreement as Exhibit A is a Schedule of Values. At the time of each Application for Payment, the Contractor shall, if requested by the Architect or the Owner, indicate (a) by percentage and dollar amount, the extent to which each such portion of the Work has been completed, and (b) the dollar amount of each payment which is allocated to (i) labor and materials incorporated into the Work, and (ii) materials not incorporated into the Work. The Schedule of Values shall be used as a basis for the Contractor's Application for Payment, but for no other purpose.

9.3.1 Delete the first two lines and insert the following:

At the time and in the manner set forth in the Owner-Contractor Agreement,

Add at the end:

Each Application for Payment shall be on forms of AIA Documents Nos. G702 and G703 or such other forms as Owner's lender(s) may require and shall be accompanied by (a) a certificate from the Contractor stating the amount of all unpaid bills owed by it to Subcontractors, to suppliers of materials, and to laborers for work and materials, or either, furnished for the purpose of performance of the Work, and (b) a certificate addressed to the Owner's Mortgagee in such form as such Mortgagee may require. Contractor agrees further to deliver upon request by Owner, from each such subcontractor, supplier, or laborer a writing which acknowledges receipt of all prior payments due and acknowledges that such payments are payment in full (less any stated retainage) of all Work previously performed or supplied by each such person which writing shall, if requested, be in form sufficient for recording with Suffolk Registry of Deeds.

9.3.4 (insert) 9.3.4 In the event a lien is filed or claimed against the work by any Subcontractor, Sub-subcontractor, laborer or supplier of materials, the Contractor agrees, unless covered by the lien bond required pursuant to Subparagraph 7.5.1 hereof, immediately to bond such lien in accordance with the provisions of M.G.L. c.254 or to cause such lien to be discharged. If the Contractor shall fail to do so, the Owner may, at its option and at the expense of the Contractor, bond such lien or cause it to be discharged.

9.3.5 (insert) 9.3.5 Unless the Contractor asserts in writing in an Application for Payment that an unpaid claim of a Subcontractor, laborer, or materialman is in dispute as to the amount owed, the Owner shall have the right to pay any such unpaid claim by check payable to the Contractor and the claiming party, and any such payment shall be a discharge of an equal amount of the Owner's obligation to pay Contractor hereunder.

9.3.6 (insert) 9.3.6 The Contractor warrants and guarantees (and agrees to provide certificates to this effect with each Application for Payment) that title to all Work, materials and equipment covered by an Application for Payment will have passed to the Owner when incorporated in the Project. The Contractor further agrees that the submission of any Application for Payment and the Contractor's receipt of payment thereof shall conclusively be deemed to waive all liens with respect to said Work, materials and labor to which the Contractor then may be entitled.

9.4.1 Delete in its entirety and substitute the following:

9.4.1 The Architect shall, within 5 business days after the receipt of the Contractor's Application for Payment, either (a) issue a Certificate for Payment to the Owner, with a copy to the Contractor, for the amount requested by the Application; or (b) issue a Certificate of Payment to the Owner, with a copy to the Contractor for the amount the Architect determines is properly due, notifying the Contractor in writing of his reasons for certifying less than the amount requested as provided in subparagraph 9.6.1; or (c) withhold his Certificate entirely and notify the Contractor in writing his reasons for withholding a Certificate as provided in subparagraph 9.6.1.

9.6.1 In the 1st and 13th line, replace the word "may" with the word "shall". In subsection .7, delete the word "persistent," and insert at the end:

Including without limitation the schedule of the Work.

9.8.1 In the 18th and 19th line, change "Substantial" to "Final". In addition, add the following at the end:

Compliance with the requirements of subparagraph 7.7.3 shall be a condition precedent to Substantial Completion.

9.9.1 Add the following sentence at the end:

If the Architect finds the Work unacceptable, he will prepare a final list of items to be completed or corrected ("Punch List"). When such items are completed or corrected to the satisfaction of the Architect, he shall promptly issue a final Certificate for Payment as provided above.

9.9.2 Change the period at the end of the first sentence to a comma, and insert the following:

(5) one full and complete set of the as-built Drawings and one full and complete set of as built drawings and specific _______ on ___________, showing all modifications or alterations to the Project made during the course of construction, and (6) one bound set (with a table of contents thereto) of all operating or maintenance instructions or descriptions of all mechanical, electrical and manually operated equipment, light fixtures, windows, doors, carpet and flooring materials. The Contractor shall provide a listing by area of all paints used with the color and manufacturer and the names, and shall also provide a list of the addresses of the distributors from which these components or materials were purchased.

Article 10: Protection of Persons and Property

10.2.4.1 (insert) 10.2.4.1 The Contractor will be solely responsible for compliance with laws and regulations governing the handling, storage, use or disposal of hazardous materials or wastes used, stored, generated, or disposed of in connection with construction of the Work, including friable asbestos, and shall obtain all permits and approvals, give all required notices, and observe all applicable procedures prescribed by the U.S. Environmental Protection Agency, the Massachusetts Department of Environmental Quality Engineering, and other governmental authorities having jurisdiction with respect to such activities. Prior to the commencement of asbestos removal work, and prior to the removal of underground oil tanks, and in all other cases at the Owner's request, the Contractor shall promptly furnish the Owner with evidence satisfactory to the Owner demonstrating the Contractor's compliance with such procedures, the giving of such notices, and the issuance of such permits and approvals, and shall indemnify the Owner and hold the Owner harmless with respect to any loss, damage or liability resulting from the Contractor's failure to observe such procedures, give such notices, or obtain such permits and approvals.

10.2.8 (insert) 10.2.8 The Contractor shall provide and maintain in good operating condition suitable and adequate fire protection equipment and services, and shall comply with all recommendations regarding fire protection made by the representatives of the fire insurance company carrying insurance on the Work or by the local fire chief or fire marshal. The area within the site limits shall be kept orderly and clean, and all combustible rubbish shall be promptly removed from the site.

10.2.9 (insert) 10.2.9 The Contractor shall at all times reasonably protect excavations, trenches, buildings and materials, from rain water, ground water, back-up or leakage of sewers, drains and other piping, and from water of any other origin and shall remove promptly any accumulation of water. Contractor shall provide and operate all pumps, piping and other equipment necessary to this end.

10.2.10 (insert) 10.2.10 The Contractor shall remove snow and ice which might result in damage or delay.

10.2.11 (insert) 10.2.11 During the progress of the Work, the Contractor shall prevent damage to completed Work or work in progress, or to materials stored on the premises. The Contractor shall take all reasonable precautions necessary to prevent loss or damage caused by vandalism, theft, burglary, pilferage, or unexplained disappearance of property of the Owner forming part of the Work located at the Project site. The Contractor shall have full responsibility for the security of such property.

10.2.12 (insert) 10.2.12 Noise and Pollution Control. All work performed under the Contract shall conform to the requirements of Chapter 111, Sections 31C and Section 142D of the General Laws, Commonwealth of Massachusetts, Department of Public Health, Division of Environmental Health.

10.2.13 (insert) 10.2.13 The Contractor shall comply with the "Rules and Regulations for the Prevention of Accidents in Construction Operations, Industrial Bulletin No. 12, effective April 19, 1967" by the Division of Industrial Safety, Department of Labor and Industries, Commonwealth of Massachusetts and the Occupational Safety and Health Act, "OSHA" and all regulations pursuant thereto. Any fines levied against the Owner due to the Contractor's (or his Subcontractor's) failure to comply with OSHA standards or other Federal, State and local regulations shall be paid by the Contractor.

Article 11: Insurance

11.1.1 In the first line, following the word "maintain", insert the words "in a company or companies to which the Owner has no reasonable objection".

11.1.2 Delete entirely and substitute the following:

11.1.2 The insurance required by Subparagraph 11.1.1 with respect to the Contractor shall be written for not less than the following:

.1 Workman's Compensation

a) State	Statutory
b) Employer's Liability	Statutory

.2 Comprehensive General Liability (Including Premises-Operations; Independent Owner's and Contractor's Protective; Products and Completed Operations Broad Form Property Damage)

a) Bodily Injury

1) Each Occurrence	$1,000,000
2) Annual Aggregate	$1,000,000

b) Property Damage

1) Each Occurrence	$ 250,000
2) Annual Aggregate	$ 500,000

.3 Personal Injury

Annual Aggregate	$500,000

.4 Completed Operations and Products Liability as well as Contractor's Liability coverage insuring the indemnity agreement in this Contract shall be maintained for two (2) year after Final Payment.

.5 Property Damage Liability Insurance shall include coverage for the following hazards:

X (excavation) C (collapse) U (underground)

In addition the policy shall be endorsed to insure against liability for damage resulting from blasting or pile-driving operations, undermining and for damage to underground pipes and utilities caused by digging with mechanical equipment.

.6 Comprehensive Automobile Liability

a) Bodily Injury

1) Each Person	$1,000,000
2) Each Occurrence	$1,000,000

b) Property Damage

1) Each Occurrence	$ 250,000

.7 Renewal certificates shall be addressed to and filed with both the Contractor and the Owner at least thirty (30) days prior to the expiration date of required policies.

.8 Unless, in particular cases, the Owner and Contractor shall agree otherwise in writing, the Contractor shall require all Subcontractors to maintain insurance conforming to the provisions of this Paragraph 15.1 and the Contractor shall maintain on file all such required Certificates of Insurance, which file shall be available for inspection by the Owner upon request.

.9 In addition to the Comprehensive General Liability coverage required to be carried by the Contractor pursuant to Paragraph 15.1(2) of this Contract, the Contractor shall also provide the Owner with Certificate(s) of Insurance under a Blanket Excess Liability policy. Said policy shall contain limits of coverage for personal Injury and Property Damage in amounts not less than $5,000,000 per each occurrence, $5,000,000 aggregate and the Owner shall be added as a named insured thereon.

11.1.4 In line 5, delete "thirty" and substitute "sixty".

11.3.1 Delete and substitute the following:

11.3.1 The Owner shall purchase and maintain so-called builder's risk insurance upon the entire Work at the site in the amount it deems reasonably necessary. This insurance shall include the interests of the Owner and the Contractor in the Work and shall insure against the perils of fire and shall include insurance for physical loss or damage including, without duplication of coverage, theft, vandalism, and malicious mischief with an agreed amount endorsement.

The insurance referred to in this subparagraph 11.3.1 shall be subject to the following limitations:

.1 Excepted from coverage shall be owned, rented or leased construction tools and equipment to be used to perform Work by the Contractor and its Subcontractors.

.2 The Contractor and its Subcontractors shall be solely responsible for all loss or damage to construction tools or equipment used to perform the Work. Any insurance protecting such equipment shall include an endorsement waiving the insurer's right of subrogation against the Owner, Architect, and their consultants.

.3 If by the terms of this insurance a deductible is required, in the event of a paid claim the Contractor shall be responsible for the deductible amount up to a sum not to exceed $2,500 per claim.

11.3.3 Delete the first sentence and insert the following:

Any loss insured under subparagraph 11.3.1 is to be adjusted with the Owner and shall be made payable to the Owner or Owner's mortgagee (or any other institution chosen by the Owner) as trustee for the insureds, as their interests may appear, subject to the requirements of any applicable mortgagee clause and of subparagraph 11.3.8.

11.3.7 Delete entirely and substitute the following:

11.3.7 Upon the occurrence of an insured loss, the Owner as trustee shall deposit in a separate interest-bearing account (if possible) any money so received and he shall distribute it in accordance with such agreement as the parties in interest may reach, or in accordance with an award of arbitration in which case the procedure shall be as provided in paragraph 7.9.

11.3.8 Insert a period after "insurers" in the second line and delete the balance of this subparagraph.

11.3.10 (insert) 11.3.10 Nothing in this Agreement shall be construed as calling for the name of the Contractor or any Subcontractor or any Sub-subcontractor as loss payee on Owner's insurance, and no draft or other instrument in payment of any loss shall name the Contractor, subcontractor and subcontractor as joint payees thereof. In the event the insurance proceeds paid to the Owner are not made available for reconstruction, the Owner shall promptly notify the Contractor of such fact and such notification shall be treated as a termination in accordance with the provisions of Article 14.

11.3.11 (insert) 11.3.11 The Contractor shall require each of its Subcontractors to procure and maintain during the life of his subcontract all the insurance reasonably required by the Owner or Owner's lender and shall not allow his Subcontractors to begin work until the insurance has been so obtained and certificates of insurance approved. The Contractor shall require each Subcontractor to provide a 30 day written notice to the Contractor of cancellation or material change to any of the insurance coverages.

Article 12: Changes in the Work

12.1.3 In the third line, insert ", as selected by Owner" after the word "ways".

12.1.3.3 Add the following at the end.

As used in this subparagraph, "Cost" shall include all items of cost and expense incurred by the Contractor resulting from the proposed change in the Work for performing the work covered by the change, including costs and expenses of labor, materials for construction, equipment and fixtures, field engineering, additional bond premium, workmen's compensation insurance, social security, public liability insurance, job overhead expenses, and all other expenses directly connected with construction, but excluding general overhead expenses, kickbacks, rebates or discounts received in connection with the construction of the Project; and excluding any return on or cost of the Contractor's working capital, such return on or cost of working capital being part of or to be paid from the Contractor's fee or profit.

12.1.4 Add the following at the end:

As used in this subparagraph, a "reasonable allowance for overhead and profit" shall mean the percentages identified in Exhibit A to the Owner-Contract Agreement, multiplied by the net increase in costs as a result of any change, determined as set forth above.

12.1.5 Delete.

12.2.2 (insert) 12.2.2 The Contractor represents and warrants that it has visited and carefully inspected the site and that it has made such investigation it deems necessary to ascertain for itself the conditions which are likely to be encountered during the performance of the Work. Since the Work includes the conversion and rehabilitation of a building, exact quantities and detailed descriptions relating to the Work may not be fully ascertained prior to the commencement and performance of the Work, and it is accordingly understood and agreed, notwithstanding any other provision of the Contract Documents to the contrary, that the Owner does not warrant or guarantee the present state of the building or the conditions that will be encountered during performance of the Work. The Contractor will make no claim for additional payments, extra work, allowances or damages, because of minor variances from conditions encountered during construction which should reasonably have been anticipated and which require additional labor or materials or cause damage. A Change Order shall be required pursuant to this Article 12 for major unforeseen or concealed conditions which require additional labor or materials or cause damage.

12.2.3 (insert) 12.2.3 Before proceeding with excavation for foundations or utility conduits, the Contractor shall obtain all available information from the various City of Boston departments and private utility companies with regard to utilities located within the area of the Project and the Contractor shall make all necessary arrangements with such municipal and/or utility officials for relocation, abandonment or temporary shut off of said facilities.

12.3.2 Add the following at the end:

If the Contractor claims that any such instructions or orders whether oral, written, by drawings, or otherwise, involve extra cost or time, and such instructions or orders are not accompanied by a written acknowledgement by the Owner or Architect that extra payment will be made or time extended, he shall promptly so notify the Architect and Owner in writing and shall not proceed with the Work until he has received from the Owner and Architect a further written order to proceed, except as provided in paragraph 10.3, in the case of any emergency affecting life or property. No claim for extra cost or time on account of such instructions or orders shall be valid unless the Contractor has so notified the Architect and Owner, before proceeding and has received the further written order to proceed.

Article 13: Uncovering and Correction of Work

13.2.1 Delete and substitute the following:

13.2.1 The Contractor shall promptly, but in all events within 30 days, correct all Work rejected by the Architect as defective or failing to conform to the Contract Documents whether or not fabricated, installed or completed. The Contractor shall bear all costs of correcting such rejected Work, including compensation for the Architect's additional services made necessary thereby and any cost, loss, or damages to the Owner resulting from such defect or failure. This obligation shall survive termination of the Contract under Article 14.

13.2.2 Insert the following immediately after the first sentence:

Final Payment or an Architect's Certificate for Final Payment shall not be deemed acceptance of unsatisfactory conditions.

13.3.1 Delete the period at the end of the final sentence, and add the following:

, and if the payments due to the Contractor are insufficient to cover the adjustment, the Contractor shall pay the difference to the Owner.

Article 14: Termination of the Contract

14.1.1 Replace the word "thirty" with the word "ninety" in the 2nd and 9th lines.

14.2.1 Delete and substitute the following:

14.2.1 If a petition is filed by the Contractor, or against the Contractor with his consent, under any federal or state law concerning bankruptcy, reorganization, insolvency or relief from creditors, or if such petition is filed against the Contractor without his consent and is not dismissed within thirty (30) days, or if the Contractor is generally not paying his debts as they become due, or if the Contractor becomes insolvent, or if the Contractor consents to the appointment of a receiver, trustee, liquidator, custodian or the like of the Contractor or of all or any substantial portion of its assets, or if a receiver, trustee, liquidator, custodian or the like is appointed with respect to the Contractor or takes possession of all or any substantial portion of its assets or if the Contractor makes an assignment for the benefit of creditors, or if the Contractor refuses or fails, except in cases for which extension of time is provided, to supply enough properly skilled workmen or proper materials, or if he fails to make prompt payment to any Subcontractor, or for materials or labor, or disregards laws, ordinances, rules, regulations or orders of any public authority having jurisdiction, or otherwise is guilty of a violation of any provision of the Contract Documents, the Owner may, without prejudice to any other right or remedy, and after giving the Contractor and his surety, if any, seven (7) days written notice, terminate the employment of the Contractor and take possession of the site and of all materials, equipment, tools, construction equipment and machinery thereon owned by Contractor and may finish the Work by whatever method Owner may deem expedient. In such case the Contractor shall not be entitled to receive any further payment until the Work is finished.

14.2.2 Insert the following after "thereby" in the 4th line the following:

plus Owner's direct and consequential damages as a result of Contractor's default

14.2.3 Insert the following at the end.

The Owner may terminate the Contract, at its option, in the case of a casualty, condemnation or other event not within the Owner's reasonable control, without prior notice. In the event of such termination, the Contractor shall be entitled to payment in accordance with the provisions of Subparagraph 14.1.1 of these General Conditions.

Article 15: Equal Opportunity/Affirmative Action

15.1 (insert) 15.1 MHFA/City of Boston Compliance. The work to be performed by the Contractor under this Agreement is for a project in which financial assistance is being provided by the Massachusetts Housing Finance Agency and the City of Boston. The Contractor therefore agrees to comply with all MHFA and City of Boston requirements including those concerning Equal Employment Opportunity, Minority and Women's Business Utilization, and Prevailing Wage Rates, disputes regarding wage rates and classifications of labor, wage claims adjustments, and the submittal of payroll and related reports. The Contractor also agrees to comply with the City of Boston requirements concerning Equal Employment Opportunity as specified in the 1987 Boston Jobs Ordinance.

15.2 (insert) 15.2 The Contractor agrees to comply with all the requirements of the City of Boston with respect to Resident Jobs Policy and Minority/Women Business Participation, as laid out in the City of Boston Compliance Contract Supplement, and with the Massachusetts Housing Finance Agency's Equal Opportunity/Affirmative Action Contract. Both of these documents are attached herewith and made part of this Agreement.

15.2.1 15.2.1 The City of Boston standards are that projects in impacted areas meet the following ratios for employment and subcontracts:

1. at least 50% of the workforce shall be Boston residents; in addition, every effort shall be made to recruit from among residents of the Roxbury/North Dorchester neighborhood;

2. at least 30% of the workforce shall be Minorities;

3. at least 10% of the workforce shall be Females;

4. at least 30% of the dollar value of the Agreement shall be awarded to Minority Business Enterprises; and

5. at least 5% of the dollar value of the Agreement shall be awarded to Women's Business Enterprises.

15.2.2 15.2.2 The Contractor shall comply fully with the applicable City of Boston, MHFA, and other governmental requirements related to Equal Opportunity and Affirmative Action in hiring and subcontractor selection and with all applicable reporting requirements.

15.2.3 15.2.3 In order to enable the Owner to monitor directly the Contractor's compliance, the Owner and Contractor shall take the following steps in addition to those required by various public agencies.

1. With respect to Minority and Women's Business Enterprises:

   a. As soon as practicable after being selected as Contractor and prior to awarding any subcontracts, Contractor shall meet with Owner to discuss the subcontractor goals listed above, the Contractor's plans for attaining these goals, and the Owner's plan for monitoring their attainment.

   b. Prior to awarding any subcontract the Contractor shall provide the Owner with the name and MBE/WBE status of each subcontractor asked to bid on the Work. This information shall be received by the Owner regarding all subcontractors bidding on a given subcontract at least two weeks prior to Contractor's award of that subcontract.

   c. Subsequent to the notification described above and prior to awarding each subcontract, the Contractor shall provide the Owner with the name and MBE/WBE status of each subcontractor with whom Contractor intends to contract, with a statement of the dollar value of the proposed contract, and with an explanation of the Contractor's reasons for declining any bid from a MBE/WBE subcontractor for this work. Owner shall receive this information at least one week prior to Contractor's award of each subcontract.

d. The Contractor shall notify the Owner promptly after the award of any subcontract, indicating the name and MBE/WBE status of the subcontractor and the dollar value of the contract. Owner shall receive this information within five working days after the award of the subcontract.

e. The Contractor and Owner shall meet, at the Owner's request, at intervals throughout the subcontractor selection process, in order to assess the Contractor's progress in meeting the Minority/Female Business Enterprise goals stipulated herein and to determine whether any additional action is necessary to help achieve these goals.

2. With respect to Workforce requirements:

a. The Contractor and all Subcontractors shall meet with the Owner as soon as is practicable after the closing of the construction loan in order to discuss the Boston Residency/Minority/Female hiring goals agreed to herein and to discuss the Contractors' and Subcontractors' proposed methods of achieving these goals.

b. The Contractor shall provide the Owner with copies of all Equal Opportunity reports submitted by the Contractor to public agencies, in particular with the Minority Utilization Reports filed with the City of Boston and with the Contractor's Monthly Staffing Report filed with MHFA. These reports shall be submitted to the Owner at the same time they are submitted to the respective public agencies.

c. The Contractor and Subcontractors shall meet with the Owner at the Owner's request if at any time during the term of this Agreement the ratios of Resident/Minority/Female workers appear to be lower than the target ratios listed herein, in order to discuss actions which can be taken to achieve the target ratios.

END OF
SUPPLEMENTARY GENERAL CONDITIONS

BOSTON HOUSING PARTNERSHIP PROJECTS II

CITY OF BOSTON
RAYMOND L. FLYNN, MAYOR
Mayor's Office of Jobs and Community Services
43 HAWKINS STREET BOSTON, MA 02114
723-1400

CITY OF BOSTON

SUPPLEMENTAL MINORITY PARTICIPATION

AND RESIDENT PREFERENCE SECTION

WORK FORCE REQUIREMENT	
BOSTON RESIDENT	50%
MINORITY PERSONS	30%
FEMALES	10%

The prime contractor and each subcontractor shall maintain not less than the above ratios of Boston Resident, Minority, and Female employee work hours to total employee work hours in each trade category worked on this contract.

The above workforce requirements shall apply to each trade that appears on the list of "Classification and Minimum Wage Rates" as determined by the Commissioner of Labor and Industries under the provisions of Chapter 149, Section 26 through 27G, of the General Laws of Massachusetts, as amended.

The prime contractor and each subcontractor shall fill not less than 50% of all training categories with Boston Residents, provided that whenever possible a greater percentage of Boston Residents shall be utilized in all training and apprenticeship categories.

Boston Resident, Minority and Female employment/training hours must be substantially uniform throughout the length of the contract in each trade category

The transfer of Boston Resident, Minority and Female employees from contractor to contractor or from project to project for the sole purpose of meeting the workforce participation requirements shall be a violation of this contract.

Boston Resident Definition: The actual principal residence of the individual where he or she normally eats, sleeps and maintains his or her normal personal and household effects. Such residence may be established by any method acceptable by the Compliance Unit including but not limited to driver's license, utility bills and rent receipts.

SECTION 7: FINES: Boston Resident Jobs Policy Ordinance
Any person who provides false information regarding his or her residence address shall be subject to a fine of not more than $300.

Minority Definition: An individual who is Black, Hispanic, Asian-American or American Indian.

The prime contractor is responsible for the compliance of all subcontractors participating in this contract. Therefore it

City's employment requirements noted about in any subcontracts for work that will be performed on this project.

MINORITY BUSINESS PARTICIPATION

A 10%_____ 30% ✓ Minority Business Participation level shall be maintained on this project. The minority business(es) utilized on the project for the purposes of fulfilling this requirement shall be in accordance with the terms of the Supplemental Minority Business Particiaption section of this contract and the Minority Business Utilization Form submitted with the bid proposal for this project.

Only businesses certified by the City of Boston Minority Business office of the NDEA will be credited towards this requirement

Any substitutions or changes from the information concerning Minority business participation submitted with the bid shall be approved by the Director of the Compliance office of the NDEA.

Minority Business Definition: A business in which at least 51% of the beneficaial ownership and control is held by one or more minority persons (Black, Hispanic, Asian-American or American Indian)

LABOR STANDARD REQUIRMENTS (HUD Funded Contracts Only)

The following checklist has been prepared to assist contractor and subcontractors in meeting contractual Labor Standards responsibilities. All major administrative and procedural activities have been covered in the sequence they will occur during the life of this project. Careful attention to and use of this checklist should result in a minimum number of problems.

BEFORE CONSTRUCTION BEGIN EACH CONTRACTOR HAS

___ Not been debarred or otherwise made ineligible to participate in any federally assisted project.

___ Received appropiate contract provisions covering Labor Standards requirements.

___ Reviewed and understands all Labor Standards contract provisions.

___ Received the wage decision as part of the contract

___ Requested and received the minimum wage for each classification to be worked on the project which was not included on the wage decision.

___ Requested and received certification from State's Bureau of Apprenticeship and Training for any trainees or apprentice employed to work on this project

AT START OF CONSTRUCTION THE CONTRACTOR MUST

Comply with the following:

___ Notify the awarding authority of construction start date in writing.

___ Has placed each of the following on a bullentin board prominently located on the project site which can be seen easil by the workers (and replaced if lost or unreadable any time during construction):
  Wage Decision
  Notice to Employee (WH4321)
  Safety and Health Protection on the Job (DOL)

___ Before assigning each project worker to work, will obtain workers name, mailing address, and Social Security number (for payroll purposes) and forward a copy to awarding authority.

___ Has obtained a copy of each apprentice's certificate with the apprentice's registration number and his year of apprenticesnip from the State BAT.

___ Will inform each worker of his/her work classification as it will appear on the payroll and his/her duties of work

___ Will comply with the minimum wage rate requirements as specified by the U.S. Dept. of Labor requires on this project that a journeyman is paid the minimum wage rate or more;

An apprentice is paid not less than the apprentice's rate for the trade based on his year of apprenticeship; or

A laborer is to do only laborer work-not to use any tool or tools of the trade-and not to perform any part of the journeyman's work and is to be paid the laborers minimum wage rate or more

___ Will inform each journeyman and each apprentice that a journeyman must be on the job at all time when an apprentice is working.

___ Must maintain a 1 to 5 ratio of journeymen to apprentice as required by the State Bureau of Apprenticeship Training on all trades where there is public bids involved. Unless bargaining agreements states otherwise

___ Will inform each employee that he/she is subject to being interviewed by the awarding authority, HUD, Dept of Labor or other government inspectors to confirm compliance with labor standards requirements.

___ Maintain accurate daily time records showing time work in each classification and the rate of pay for each classification, records must be signed.

REPORTING PROCEDURES

Employment Plan Form

The Employment Plan Form is an outline of the contractors anticipated workforce. It must be completed and submitted to the Compliance Monitor by the prime contractor and its subcontractors prior to the pre construction Conference.

Monthly Utilization Report

The prime contractor and its subcontractors shall submit a Monthly Workforce Utilization Report no later than the 10th day following each month that work is performed. After the start of construction, reports must be submitted whether or not any work was performed. All reports must be completely and correctly filled out with original signatures on each report. Forms are available from the Compliance Unit.

Monthly Workforce Report - Form 257 (Federal contracts only)

The Monthly Work Force Report-~~Form~~ 257 is used by the U.S. Dept. of Labor to verify contr~~actor~~'s compliance with the Executive Order 11246. The total number of work hours by sex and ethnic background in each trade category is required.

Minority Business Documentation

A copy of all contracts, invoices and checks issued to the Minority Business(es) utilized on this project shall be forwarded to the compliance monitor/awarding authority, along with the final Minority Business Utilization Form before final payment will be issued.

The prime contractor shall submit a copy of a letter to all subcontractors not in attendance delineating the City of Boston Supplemental Minority Participation and Resident Preference Section.

The prime contractor and each subcontractor must document all reasons for not compling with the above regulations when found to be out of compliance.

DURING CONSTRUCTION EACH CONTRACTOR

___ Will not select, assign pay lower rates to, transfer, upgrade, demote, lay off, nor dismiss any worker because of race, color, religion, sex or national origin.

___ Will comply with all health and safety standards

___ Will pay all workers weekly.

___ Will submit workforce information on the Weekly Utilization report which includes the same information as the WH 347 forms.

A computer printout may be substituted for the Monthly Utilization report providing it includes the front and back information contained on the Monthly Utilization report.

For questions concerning filling out the Monthly Utilization reports contact the Compliance and Enforcement office for technical assistance.

NOTE: DUE THE 10TH DAY OF EACH MONTH FOR THE PRECEEDING MONTH

MAYOR'S OFFICE OF JOBS & COMMUNITY SERVICES — COMPLIANCE AND ENFORCEMENT DIVISION

MONTHLY UTILIZATION REPORT

AWARD DEPT.

PERCENT COMPLETED

PROJECT DATE OF COMPLETION

ONTH OF: ______________ TO: ______________

Name of Contractor ( ) or subcontractor ( )

CODES:
1 Caucasian
2 Black
3 Hispanic
4 Asian
5 Other

Address

Phone number

Project & Location

Project or Contract No

Only necessary for Federal Contracts

Name & address	SEX M/F	Work Classification	Ethnicity (See Codes)	OT ST	wk 1	wk 2	wk 3	wk 4	wk 5	Total Hours	Rate of Pay	Gross Amount Earned	FICA	With holding Tax	State w/h	Union	Total	Net Wages Paid
				O														
SS#				S														
				O														
SS#				S														
				O														
SS#				S														
				O														
SS#				S														
				O														
SS#				S														

ame & Title

Signature

Date

HE WILFUL FALSIFICATION OF ANY OF THE ABOVE STATEMENTS MAY SUBJECT THE CONTRACTOR OR SUBCON HACTOR TO CIVIL OR CRIMINAL PROSECUTION SEE SECTION 1001 OF TITLE 10 AND SECTION 231 OF TITLE 31 OF THE NITED STATES CODE.

MAIL TO:
MAYOR'S OFFICE OF JOBS AND
COMMUNITY SERVICES
COMPLIANCE & ENFORCEMENT
43 HAWKINS STREET

RACE AND ETHNIC STANDARDS

1) Caucasian - A person having origins in any of the original peoples of Europe, North America, or the Middle East.

2) Black - A person having origins in any of the black racial groups of A

3) Hispanic - A person of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish/Indian cultural origins (this category is not t include persons of European or Arabic ancestry).

4) Asian or Pacific Islands - A person having origins in any of the origi peoples of the Far East, Southeastern Asia, the Indian Subcontinent, or t Pacific Islands. This area includes China, Japan, Korea, the Philippine Islands, Samoa, India, Pakistan, Bangladesh, Sri Lanka, Nepal, Sikkim, an Bhutan.

5) American Indian or Alaskan Native - A person having origins in any of t original peoples of North America, and who maintains cultural identificati through tribal affiliation or community recognition.

NOTE: ETHNIC CLASSIFICATIONS 2-5 ARE BASED ON SECTION ONE, (11) OF THE 19 ORDINANCE ESTABLISHING THE BOSTON RESIDENT JOBS POLICY AS DEFINED BY THE U BUREAU OF THE CENSUS AND PROMULGATED BY THE FEDERAL OFFICE OF MANAGEMENT A BUDGET.

AREAS THAT COMPRISE THE CITY OF BOSTON

ALLSTON
BRIGHTON
CHARLESTOWN
DORCHESTER
EAST BOSTON
HYDE PARK
JAMAICA PLAIN
MATTAPAN
NORTH END
READVILLE
ROSLINDALE
ROXBURY
SOUTH BOSTON
SOUTH END
WEST ROXBURY

RESIDENCY VERIFICATION FORM

Project: ____

Contractor or
Subcontractor: ____________________________________

To be completed by Employee:

Name of Employee: ______________________________

Employee's Residential
Address: ____

I hereby state under the pains and penalties of perjury that
foregoing information is true.

Signature
of Employee: ____________________________________

Date: ____

To be completed by Contractor or Subcontractor:

The foregoing information was verified by the following

Driver's License ______
Utility Bill ______
Rent Receipt ______
Return Mail
Receipt ______
Other
(Please Specify) ______

The foregoing information was not verified: ______

Signature of Contractor
or Subcontractor: ________________________________

Date: ____ ______________________________________

PLEASE INCLUDE A COPY OF ONE OF THE ABOVE AS PROOF OF RESIDENCY.

ATTACHMENT "C"

PROJECT: ______________________________

To: Mayor's Office of Jobs and Community Services
Compliance and Enforcement Division
43 Hawkins Street
Boston, MA 02114

Attn: __________ ________________ Date: ___________

To Whom It May Concern: RE: Start Work Notif

Please be advised that ____________________ below-listed Subcont

will be starting work in the field at the above Project:

Subcontractor: ______________________________

Address: ______________________________

____

Work To Be Performed: ______________________________

Approximate Start Date: ______________________________

Approximate Completion Date: ______________________________

Employing Construction Trade (s): ______________________________

____

____

Anticipated Average Daily Work Force: ______________________________

Very truly yours,

(0460B)

Project: ______________________________

To: Mayor's Office of Jobs & Community Service
Compliance & Enforcement Division
43 Hawkins Street
Boston, MA 02114

Attn. Date: ____________________

To Whom It May Concern: **Re: STOP WORK NOTIFICATION**

Please be advised that ____________________ below-listed Subcontract

ceased work in the field at the above Project:

Subcontractor: ______________________________

Trade(s) Employed: ______________________________

____

____

Reason for Work Termination: ____________________

____

Very truly yours,

CB/mf
(doc: 0007B)

Preconstruction Conference Attendance Sheet

Date____________________
Time____________________
Awarding Dept.____________
Monitor__________________

Contract Name_______________________ Funding Source____________

Project Location____

Contract Award Date__________________

Contract Number_____________________

Contract Amount_____________________

The prime contractor and each subcontractor understand and agree to comply with all appropriate federal and city regulations.

Awarding Department
DCCO Name____

Compliance Monitor:______________________________________

Prime Contractor
Company Name____
Representative Name____________________________________

Subcontractors

Company Name__________________________________
Representative Name____________________________________

Company Name____
Representative Name____________________________________

Company Name ____
Representative Name____________________________________

Company Name ____
Representative Name____________________________________

Company Name____
Representative Name____________________________________

Company Name____
Representative Name____________________________________

Company Name ____
Representative Name___________________________________

BOSTON RESIDENT JOBS POLICY AND MINORITY/WOMEN BUSINESS PARTICIPATION

COMPLIANCE CONTRACT SUPPLEMENT

NOTE: THIS IS A DRAFT DOCUMENT AND MAY BE AMENDED PENDING REVIEW BY THE CITY OF BOSTON LAW DEPARTMENT. THIS DOCUMENT OUTLINES RESPONSIBILITIES OF THE GENERAL CONTRACTOR AND IN NO WAY DISMISSES THE OWNER FROM THE OBLIGATION TO MEET ANY AND ALL COMPLIANCE REQUIREMENTS ASSOCIATED WITH THE BOSTON HOUSING PARTNERSHIP PROJECTS AND TO ENSURE THAT THE GENERAL CONTRACTOR DOES THE SAME.

June 9, 1988

INTRODUCTION

The Mayor's Office of Jobs and Community Services Compliance and Enforcement Division exists to ensure that a fair share of employment and business benefits on city-assisted construction projects go to Boston residents, minorities and females.

Recent policy developments related to construction employment and business opportunities include:

1) An "Ordinance Establishing the Boston Employment Commission" has been in effect since September 26, 1986. The Commission was created to ensure that findings made with respect to the Boston Resident Jobs Policy are determined in a manner that is comprehensive, consistent and fair for all parties involved. The Ordinance authorizes a seven (7) member commission to monitor, make judgments and issue sanctions in the area of construction employment. The Ordinance ensures that such findings are made by an independent body with established commitment to the Boston Resident Jobs Policy.

2) Mayor Raymond L. Flynn signed an Executive Order and approved a City Council Ordinance on Minority and Women Business Enterprise Development during 1987, and effective since December 31, 1987. Language of this Ordinance pertaining to construction reads as follows:

> "A minimum of fifteen percent (15%) of the eligible contract dollars of each construction related contract awarded during each fiscal year shall be awarded to certified MBEs. The fifteen percent minimum shall be increased to thirty percent (30%) of the eligible contract dollars of each construction related contract let within an impacted area. A minimum of five percent (5%) of the eligible contract dollars of each construction related contract awarded during each fiscal year shall be awarded to certified WBEs."

As a condition of receiving public funds and other forms of public assistance, developers and contractors must agree to hire Boston residents, minorities and females, to use minority and women contractors and/or suppliers and to comply with federal laws concerning wage and work conditions where applicable. The following document outlines all pertinent policies and procedures that developers and contractors must comply with.

The following is a general description of compliance requirements. Alll pertinent forms and instructions will be provided to the General Contractor during pre-construction meetings with MOJCS, MHFA, PUBLIC FACILITIES DEPARTMENT AND THE OWNER.

CONTRACT REQUIREMENTS:

ARTICLE I: DEFINITIONS
For the purpose of this section, the following terms shall mean:

A. AWARDING AUTHORITY: The department of the City of Boston granting a loan(s) or funds for the project. or is involved through ownership of the property.

B. OWNER: Party to which the Awarding Authority grants funding for construction project. Owner in turn awards construction contract for the project.

C. COMPLIANCE AND ENFORCEMENT DIVISION: The Compliance and Enforcement Division of the City of Boston, Mayor's Office of Jobs and Community Services is responsible for ensuring compliance with the Boston Resident Jobs Policy as embodied in the 1986 City of Boston Ordinance Establishing the Boston Employment Commission, and the Minority and Women Business Enterprise Development Executive Order and Ordinance.

D. "CONTRACT", means a legally enforceable agreement for the provision of supplies, labor, materials, services, construction, franchieses, concessions, or leases granted by or on behalf of the City.

E. "ELIGIBLE CONTRACT DOLLARS" shall refer to the total dollar amount of contracts awarded or expensed as set forth under the provisions of this Executive Order and guidelines and procedures issued pursuant thereto.

F. EMPLOYMENT PLAN: Identifies the individual trades that will make up the workforce that a contractor will use on the project. It is designed to define how a contractor intends to comply with the workforce requirements (i.e. 50% Boston residents, 25% minority and 10% female).

G. "FISCAL YEAR", means the period from July 1, through June 30.

H. "IMPACTED AREA", means an area of the City where the proportion of minority residents is greater than the proportion of minority residents in the City as a whole, as determined by OJCS through the use of census data.

I. MINORITY/WOMEN BUSINESS ENTERPRISE (M/WBE): means a business which is owned, controlled, and managed by one or more Minority Persons or Women.

"OWNED", means a business which is at least fifty-one percent (51%) owned by one or more Minority Persons or Women.

1. In the case of a corporation, at least fifty-one percent (51%) of all classes of voting stock and/or interests of such corporation must be owned by one or more Minority Persons or Women.
2. In the case of a partnership, at least fifty-one percent (51%) of such partnership interest must be owned by one or more Minority Persons or Women.
3. In the case of a limited partnership, the Minority Persons or Women must act as general partners and own at least fifty-one (51%) of the general partnership interest of such limited partnership.
4. In the case of a joint venture, at least fifty-one percent (51%) of the controlling Interest of such joint venture must be owned by one or more Minority Persons or Women.
5. In the case of a sole proprietorship, the Minority Person or Women must own and control the business.
6. In any other form of business organization, one or more Minortiy Persons or Women must own at least fifty-one percent (51%) of the business.
7. An ownership interest held by one or more Minority Persons or Women shall not qualify as being an interest held by said person(s) if an agreement, option, scheme, security interest, or document would, if exercised, result in less that fifty-one percent (51%) ownership of the business and/or dominant control of the business by one or more Minority persons or Women.

J. "MINORITY PERSON", means a citizen or legal resident alien of the United states who is Black, Hispanic, Native American, Asian or Cape Verdean, as defined by the Massachusetts State Office of Minority and Women Business Assistance (SOMWBA).

K. "CONTROLLED", means a business whose management policies and daily business operations are dominantly controlled by one or more Minority Persons or Women. Control shall include, but not be limited to, dominant control over:

1. the purchase of goods, equipment, business inventory, and services,

2. the hiring and firing of employees,

3. the corporate accounts and other financial affairs, and

4. solicitation and negotiation of contracts and the offering and acceptance or rejection of bids.

L. OFFICE OF MINORITY BUSINESS: The Office of Minority Business (also referred to herein as the Minority/Women Business Office) of the Mayor's Office of Jobs and Community Services is that office which has the primary responsibility for identifying and verifying minority and women businesses and for monitoring city departments and contractors for compliance with the city's policy as it relates to departments, contractors and minority/women businesses.

M. RESIDENCE: The actual principal residence of an idividual where the or she normally eats, sleeps, and maintains his or her normal personal and household effects. Such residence may be established by any documentation acceptable to the Compliance and Enforcement Division including but not limited to driver's licenses, utility bills, and rent receipts.

N. THE ORDINANCE: The Boston Resident Jobs Policy, an act of the City Council of Boston, dated October 14, 1983.

O. THE COMMISSION: The Boston Employment Commission as defined in the 1986 Ordinance Establishing the Boston Employment Commission: City of Boston Ordinances of 1986, Chapter 12 as amended by chapter 17.

P. CONTRACTOR: The General Contractor for the project.

ARTICLE II: EQUAL EMPLOYMENT OPPORTUNITY PROGRAM FOR MINORITIES, FEMALES AND BOSTON RESIDENTS (LABOR)

A. ANTI-DISCRIMINATION AFFIRMATIVE ACTION: During the performance of this contract, the General Contractor shall agree and require its subcontractors to agree to the following:

1. In connection with the performance of work under this contract, the contractor shall not discriminate against any employee or applicant for employment because of race, color, religious creed, national origin, age or sex. This commitment shall refer to, but not be limited to, the following: employment upgrading, demotion or transfer, recruitment, advertising, recruitment layoff, termination, rates of pay or other forms of compensation, conditions or privileges of employment, and selection for apprenticeship or other training categories.

2. In connection with the performance of work under this contract, the contractor shall undertake good faith affirmative action measures designed to eliminate any discriminatory employment barrier based on race, color, religious creed, national origin, age and sex, and to ameliorate and remedy the effects of such discrimination in the past. Such affirmative action shall include positive measures to ensure equal opportunity in the areas of hiring, upgrading, demotion or transfer, recruitment, layoff or termination, rate of compensation and in-service or apprenticeship and other training programs.

B. CITY ORDINANCE ESTABLISHING THE BOSTON RESIDENT JOBS POLICY, OCTOBER 14, 1983:

1. BOSTON RESIDENTS: The contractor and its subcontractors shall maintain a not less than 50% ratio of Boston resident employee workhours to total employee workhours throughout the life of the project in each trade worked on this contract.

2. MINORITY WORKFORCE: The contractor and its subcontractors shall maintain a not less than 25% ratio of minority employee workhours to total employee workhours on each trade worked on the contract.

3. FEMALE WORKFORCE: The contractors and its subcontractors shall maintain a not less than 10% ratio of female employee workhours to total employee workhours worked on this contract.

4. APPLICABLE TRADES: The workforce requirements of paragraphs (1), (2), and (3) above shall apply to each trade that appears on the list of "Classification and Minimum Wage Rates" as determined by the Commissioner of Labor and Industries under the provisions of Chapter 149, Section 26 through 27G, of the General Law of Massachusetts as amended.

C. COLLECTIVE BARGAINING AGREEMENTS: Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the contractor has a collective bargaining agreement shall excuse the contractor's obligations under the City Ordinance or this Article.

D. SUBCONTRACTS: The General Contractor shall ensure that any subcontracts entered into for construction under the prime contract shall contain specific reference to this Article and all related requirements, so that they shall be binding contractual obligations for all tiers of work.

E. TRAINING: The contractor and its subcontractors shall fill not less than 50% of all training categories with Boston residents, provided that whenever possible a greater percentage of Boston residents shall be utilized in all training and apprenticeship categories.

F. PRE-BID CONFERENCE: The Owner in conjunction with the Awarding Authority and the Compliance and Enforcement Division may conduct at least one pre-bid conference to explain the workforce requirements of the City Ordinance.

G. PRE-AWARD REQUIREMENTS: The General Contractor shall, at the time he returns the contract specifications with the required bonding and insurance forms, submit a completed Employment Plan. The contract execution process will not be initiated until the Employment Plan is submitted.

1. The Employment Plan identifies the contractor's intent to comply with the hiring requirements of this Article and the City Ordinance. This plan must describe efforts that the contractor will make to ensure that its workforce on the project conforms to requirements. The adequacy of the Employment Plan and the contractor's continued compliance with its provisions will be an important factor in the determination of the contractor's good faith efforts to comply with the Ordinance.

H. CONTRACTOR COMPLIANCE RESPONSIBILITY:

1. PRE-CONSTRUCTION CONFERENCE: Prior to the commencement of work for the contract, the Owner and the Awarding Authority in conjunction with the Compliance Division, shall conduct at least one pre-construction conference to explain the workforce requirements. The general contractor shall atend and ensure that all subcontractors to be used on the project also attend the pre-construction conference. The owner, general contractor and subcontractors shall sign a copy of the pre-construction conference minutes to indicate that all participants working on the project understand their contractual obligations.

   SUBCONTRACTORS: In the event that subcontractors are not yet identified at the time of the pre-construction conference, general contractor shall provide written notification to the Compliance and Enforcement Division within ten (10) working days of award of any subcontract for construction work under the Prime Contract. The notification shall list the project name, the name, address and telephone number of the subcontractor, dollar amount of the subcontract, and estimated starting and completion dates of labor to be supplied under the subcontract.

   The general contractor, upon entering into an agreement with the subcontractor, shall submit a subcontractor Employment Plan to the Compliance Division prior to start of work.

2. DEBARRED SUBCONTRACTORS: The contractor shall not enter into any subcontract with any person or firm debarred from contracts pursuant to this Article.

3. RECRUITMENT & DOCUMENTING GOOD FAITH EFFORT: In the hiring of minorities, females and Boston residents as journeymen, apprentices, advanced trainees, trainees and helpers, the contractor and its subcontractors may rely on traditional referral methods utilized by the construction industry, and shall also take specific affirmative action to ensure equal employment opportunity. The evaluation of the contractor's compliance with these specifications shall be based upon its efforts to achieve maximum results from its actions. The contractor shall document these efforts fully and implement affirmative action steps at least as extensive as the following:

   a. Establish and maintain a current list of Boston resident, minority and female recruitment sources and community organizations including, but not limited to, the City of Boston Construction Trades Skills Bank, also known as and hereafter referred to as The Jobs Bank. When the Contractor or its unions have employment opportunities available, a record of the request for Boston residents, minorities and females shall be maintained and a record of the organizations' responses to the request for referrals shall also be maintained.

b. Maintain a current file of the names, addresses and telephone numbers of each Boston resident, minority and female referral from a union, a recruitment source, a community organization, or an off-the-street applicant. A record of what action was taken with respect to each individual shall be maintained. If such individual was sent to the union hiring hall for referral and was not referred back to the contractor by the union, or if referred but not employed by the contractor, this shall be documented in the file with the reason, along with whatever additional actions the contractor may have taken.

c. Provide immediate written notification to the Compliance and Enforcement Division when the union or unions with which the contractor has a collective bargaining agreement has not referred to the contractor a Boston resident, minority person or female sent by the contractor, or when the contractor has other information that the union referral process has impeded the contractor's efforts to meet its obligations.

d. Disseminate the contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report etc; by specifically reviewing of the policy with all management personnel and with Boston all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

e. Disseminate the contractor's EEO policy by advertising it in the news media, specifically including Boston residents, minority and female employees; provide written notification to discuss the contractor's EEO policy with other contractors and subcontractors with whom the contractor does or anticipates doing business.

f. The General Contractor shall direct its recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with Boston resident, minority and female students and to Boston resident, minority and female recruitment and training organizations serving the City of Boston's employment needs.

g. Ensure and maintain a working environment free of harassment, intimidation and coercion at all sites and in all facilities at which the contractor's employees are assigned to work, with specific attention to Boston resident, minority or female employees working at such sites or in such facilities. Ensure that all foremen, superintendents, and other on site supervisory personnel are aware of and carry out the contractor's obligation to maintain such a working environment.

4. START OF CONSTRUCTION: The construction start date (beginning of work on the site) shall be established at the preconstruction conference. In the event that a firm date cannot be established at the preconstruction conference, both the Owner and the general contractorshall notify the assigned Division's Compliance and Enforcement Construction Manager, in advance, of the date that work is to start on a project. Further, the owner and/or general contractor shall advise the Construction Manager of dates that subcontractors are starting work on a project.

5. MONTHLY UTILIZATION REPORTS: The Contractor and all subcontractors shall prepare and submit to the Compliance and Enforcement Division Monthly Utilization Reports no later than the 5 days following each month work is performed. In the event that work is suspended for any reason, the contractor or subcontractor shall notify the Compliance Division of the date work was suspended and the date that work commencement is anticipated by submitting a start/stop work notification form.

   These reports shall document the name and address of each worker, social security, the sex, work classification, ethnicity, hours worked on the project, and rate of pay. If this contract is funded with Federal funds,(General Contractor should consult awarding authority) then the payroll deductions section and reverse side of the Weekly Utilization Report should also be completed. The Owner and/or Awarding Authority may require copies of/this report sent to them as well. The Monthly Utilization Reports must be signed by a company official.

6. DESIGNATION OF RESPONSIBILITY: The contractor designates a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Owner, Awarding Authority, Compliance and Enforcement Division or the City of Boston, and to keep records.

7. ACCESS TO RECORDS: The contractor and its subcontractors shall provide all information and reports required at the request of either the Owner, Awarding Authority, BEC, the Compliance and Enforcement Division, or the City of Boston, and shall permit access to its facilities and any books, records, accounts, and other sources of information which the Compliance and Enforcement Division determines relates to the employment of personnel.

This paragraph shall apply only to information pertinent to compliance with this Article. Where information is in the exclusive possession of another who fails or refuses to furnish this information, the developer shall ensure that the contractor demonstrates and sets forth to the Compliance and Enforcement Division efforts it has made to obtain this information. Referral orders and records of each contractor's and subcontractor's attempts to recruit Boston resident, minority, and female employees shall be maintained and made available to the Compliance and Enforcement Division within 7 days of the request by said Division.

8. ON-SITE INSPECTIONS: The Compliance and Enforcement Division shall have the right of access to the construction site in order that on-site inspections may be conducted.

9. DOCUMENTED COMPLIANCE EFFORT: The general contractor, and its subcontractors shall be deemed to be in compliance with Section B., #1-4 of this Article, if they have demonstrated to the satisfaction of the Owner, Compliance and Enforcement Division and the Awarding Authority that the General Contractor has taken all reasonable steps to comply with the provisions of this Article. Such reasonable steps shall include documentation of all outreach efforts. (See Section H., #3).

I. NON-COMPLIANCE:

1. INVESTIGATION: Whenever the Owner, Compliance Division, The Commission or Awarding Authority believe the contractor or subcontractors may not be operating in compliance with the terms of this Article, (see section H., #9 for documented effort) the Compliance Division shall notify the owner or contractor and subcontractors and conduct an investigation to determine the contractor's good faith efforts to comply with the requirement of this Article. The Compliance Division shall present its findings to the Commission and the Awarding Authority within seven days after completion of the investigation.

2. HEARING: The Awarding Authority and Compliance and Enforcement Division will hold the Owner and/or General Contractor responsible for apparent non-compliance of this article in a manner as provided in the 1986 Ordinance Establishing the Boston Employment Commission: City of Boston Ordinance of 1986, Chapter 12 as Amended by Chapter 17. Determinations of non-compliance are made by the Commission and a party subject to its jurisdiction shall be entitled to a hearing in the manner prescribed by the 1986 Ordinance.

J. SANCTIONS: In the event that the contractor fails or refuses to comply with this Article, the Commission may recommend to the Awarding Authority the imposition of one or more of the following sanctions upon the project, as it deems appropriate, to attain full and effective enforcement:

1. The suspension of any payment or part thereof due or to become due under the contract until such time as the contractor is able to demonstrate its compliance with the terms of this contract.

2. The recovery by the Awarding Authority from the Developer of up to, but not more than, 1/10 of 1% of the contract award price in the nature of liquidated damages for each week of non-compliance.

3. The termination of the contract, in whole or in part, unless the contractor is able to demonstrate within a time specified by the Compliance Division time his compliance with the terms of the contract, or demonstrate to the satisfaction of the Compliance Division that it is incapable of complying.

4. The denial to the general contractor of the right to participate in any future contracts awarded by the Awarding Authority for a period of up to three (3) years from the date the Commission finds non-compliance.

5. **Terms and conditions relating to compliance upon the owner and/or contractor for future city-assisted projects.**

K. SANCTIONS FOR SUBCONTRACTORS: The contractor shall carry out such sanctions and penalties for violation of this Article, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to this Article by the Awarding Authority.

L. SEVERABILITY: The provisions of this Article are severable, and if any of these provisions shall be held unconstitutional by any court of competent jurisdiction, the decision of such court shall not affect or impair any of the remaining provisions.

ARTICLE III: MINORITY/WOMEN BUSINESS UTILIZATION (M/WBU)

A. EXPENDITURES ON MINORITY BUSINESS ENTERPRISES:

1. The amount required to be expended on Minority/Women Business Enterprises by the owner/general contractor shall be determined in accordance with the City's policy on Minority/Women Business Participation in impacted and non-impacted areas, as defined in the Executive Order and Ordinance on "Minority and Women Business Enterprise Development," effective 12/31/87 (see Appendix VII) which states in part:

   A minimum of fifteen percent (15%) of the eligible contract dollars of each construction related contract awarded during each fiscal year shall be awarded to certified MBEs. The fifteen percent minimum shall be increased to thirty percent (30%) of the eligible contract dollars of each construction related contract let within an impacted area.

   A minimum of five percent (5%) of the eligible contract dollars of each construction related contract awarded during each fiscal year shall be awarded to certified WBEs.

   A Minority/Women Business Enterprise which merely acts as agent or passive conduit in connection with the provision of services or materials, will not be counted towards a contractor's minority/women business percentage requirement.

B. GENERAL PROCEDURES FOR COMPLIANCE WITH THE MINORITY/WOMEN BUSINESS UTILIZATION REQUIREMENTS:

1. A pre-bid conference may be conducted by the Owner in conjunction with the Awarding Authority and Compliance and Enforcement in order to familiarize bidders with the purpose and operation of Article III on Minority/Women Business Utilization.

2. A Minority/Women Business may apply to the Minority Business Office for a determination of its minority and/or women status for the purposes of performing work on any contract funded by the City to which this Article applies by completing a Minority/Women Business Certification Application and submitting it to the Minority Business Office.

3. Every six months the Minority Business Office shall publish a list of Minority/Women Enterprises that conform to the definition of Minority/Women Business Enterprises provided in Article I. The Minority Business Office may make available to prospective bidders other information regarding Minority/Women Business Enterprises for the purpose of implementing these sections. This section shall not be construed as limiting bidders in selecting or negotiating with Minority/Women Business Enterprises not listed in the Directory for the purpose of complying with this section.

4. The Owner/General Contractor may exercise his/her own judgement in selecting the Minority/Women Business Enterprise to perform any portion of the work or to be a supplier of goods or services. In the event that the developer/contractor selects a minority/or women business that is not included in the Minority/Women Business Directory provided by the Minority Business Office, then a Certification Application completed by the non-certified business must be filed prior to loan closing. If the Minority/Women Business Office determines that the proposed Minority/Women Business Enterprise is not eligible for certification, the dollar amounts obligated to a non-certified minority or women business will not count toward the contractor's minority/women business percentage requirement.

C. COMPLIANCE AFTER CONTRACT AWARD:

1. CONTRACT WITH THE MINORITY/WOMEN BUSINESS ENTERPRISE: The contractor shall execute a contract with each Minority/Women Business Enterprise it has listed on the M/WBU-F for the performance of work or the supply of goods and services, except as provided in Section D.,#2 below. The contractor shall submit a copy of the contract to the Owner as soon as it is executed. The Awarding Authority may disapprove payment for all work performed on a project until a copy of the contract is submitted to the Owner.

   After the Minority/Women Business Enterprise has completed its contractual obligations, the contractor shall submit to the Owner, Awarding Authority and the Compliance and Enforcement unit a F-MWBU Form along with copies of cancelled checks showing that the Minority Women/Business Enterprise has fulfilled its contractual obligations and has been paid.

   The Awarding Authority shall notify the Minority/Women Business Office in writing when the Owner/contractor has requested final payment. The Minority Business Office shall notify the Awarding Authority within forty-eight (48) hours of receipt of said notification if there are any outstanding issues of non-compliance with this Article.

2. SUBSTITUTION: In the event that a contractor desires to substitute a Minority/Women Business Enterprise for the one named on the MWBU-F, the contractor shall inform the Owner and shall request, in writing, authorization to substitute from the Minority Business Office.

   The contractor shall forward a copy of the request to the minority/women business named on the MWBU-F. After investigating the request, the Minority Business Office shall decide whether it should authorize the request for substitution. The Owner shall not under any circumstances authorize a request if the Minority/Women Business Office determines that the purpose of the request is primarily to engage another Minority/Women Business Enterprise at a price lower than the Minority/Women Business Enterprise listed on the MWBU-F submitted at bid. The Minority Business Office shall decide whether the proposed substitution is a bona fide Minority/Women Business Enterprise.

3. ACCESS TO INFORMATION: The contractor and all subcontractors shall provide all information and reports requested by the Owner, Awarding Authority, BEC or the Minority/Women Business Office and shall permit access to their facilities and all books, records, accounts with financial institutions, and other sources of information which may be determined by the Owner, Awarding Authority or Minority/Women Business Office to be relevant to the determination of compliance with the requirements of Article III. Where such information requested is in the exclusive possession of another party who fails or refuses to furnish information, the contractor or subcontractor shall so report to the Minority/Women Business Office and shall set forth what effort was made to obtain such information.

D. NON-COMPLIANCE:

1. INVESTIGATION: Whenever the Compliance Division, Owner, or Awarding Authority believes the contractor or subcontractors may not be operating in compliance with the terms of this Article, the Minority Business Office shall notify the contractor and subcontractors, conduct an investigation and issue its findings within seven days of completion of the investigation to the Commission.

2. DOCUMENTED COMPLIANCE EFFORT: If the contractor desires to comply with Article III, Section A, but for reasons beyond its control cannot do so, the contractor in conjunction with the Owner may submit to the Minority/Women Business Office the reasons for its inability to comply and a proposed plan stating how it intends to meet its obligations under Section A. If the Minority Business Office approves the plan, said plan shall govern the contractor's performance in meeting its obligations, under the Minority Participation and Residency Preference Section.

3. HEARING: **The Compliance and Enforcement Division may, in its discretion hold a hearing to determine non-compliance whenever it deems appropriate. Hearings shall be informal and shall not be subject to the requirements of MGL Chapter 30-A. Further actions or determinations of non-compliance shall be made by the Commission as prescribed in the 1986 Ordinance and parties subject to its jurisdiction shall be entitled to a hearing as provided in the Ordinance.**

E. SANCTIONS: In the event that the contractor or any subcontractor fails or refuses to comply with this Article, the Awarding Authority may, upon recommendation of the, Commission impose one or more of the following sanctions as it deems appropriate to attain full and effective enforcement.

1. The suspension of any payment or part thereof due, or to become due, under the contract until such time as the contractor or the subcontractor is able to demonstrate compliance with the terms of this contract.

2. The recovery by the Awarding Authority from the general contractor of up to but not more than 1/10 of 1% of the contract award price in the nature of liquidated damages for each week of the contractor's non-compliances. When a subcontractor is in non-compliance, the recovery of 1/10 of 1% of the subcontractor price is to be assessed by the general contractor against the subcontractor in the nature of liquidated damages for each week of subcontractor's non-compliance.

3. The termination of the contract in whole or in part, unless the contractor or the subcontractor is able to demonstrate within a time specified by the Minority Business Office its compliance with the terms of this contract, or demonstrate inability to so comply.

4. The denial to the general contractor or the subcontractor of the right to participate in any future contracts awarded by the Awarding Authority for a period of up to three (3) years from the date the compliance office finds non-compliance.

If the Awarding Authority does not follow the recommendation of the Commission, it shall within 30 days after said recommendation state in writing to the Compliance Division, the reason(s) for not imposing such recommendation.

F. SEVERABILITY:

The Provisions of this Article are severable, and if any provisions are held unconstitutional by any court of competent jurisdiction, the decision of such court shall not affect or impair any of the remaining provisions.

IMPACTED AREAS

1. As provided in Article III, Section A, those areas in which a contractor shall expend (30%) on Minority Business Enterprises are described as the following:

   Starting at the intersection of Lincoln Street and Stuart Street northerly along Lincoln Street to Essex Street. Thence southerly along Washington Street to Stuart Street. Thence along Stuart Street to Park Street. From Park Street along Stuart Street to Clarendon Street. Thence northwesterly Boylston Street westerly to the Back Bay Fens Park Drive to the Boston-Brookline Town Line, along the Jamaica Way to Byner Street, southerly along Center Street. South Street to Arborway easterly tp Forest Hills Square - Hyde Park Avenue southerly to Walk Hill Street. Walk Hill Street to American Legion Highway southerly to Cummins Highway - Greenfield Street, Rector Road to River Street northeasterly to Mattapan Square northerly along River Street to Ridgeview Avenue northerly to Woodbole Avenue and Morton Street. Thence to Pierce Square. Thence northerly along Dorchester Avenue to Columbia Road. Thence turning westerly to Edward Square and Massachusetts Avenue to Midland Division Rail Road northerly to Fitzgerald Expressway northerly along Expressway to point origin.

2. Any questions as to whether a specific project or part thereof falls within an impacted area shall be determined by the Director, Minority Business Office, 15 Beacon Street, 5th Floor, Boston, MA at 720-4300, ext. 212.

MHFA EQUAL EMPLOYMENT OPPORTUNITY REQUIREMENTS FOR ROXBURY CORNERS

Work Force Requirements:

- -- 50% Boston Residents
- -- 25% Minority (MBE)
- -- 10% Female (WBE)

MASSACHUSETTS HOUSING FINANCE AGENCY

EQUAL OPPORTUNITY/AFFIRMATIVE ACTION CONTRACT for CONSTRUCTION

DATE:

MHFA No: **FHA No.(if applicable):**

DEVELOPMENT-NAME and ADDRESS:

OWNER-NAME and ADDRESS:

DEVELOPER-NAME and ADDRESS:

CONTRACTOR-NAME and ADDRESS:

CONSTRUCTION CONTRACT TERM:

CONSTRUCTION CONTRACT-COST:

MINORITY HIRING GOAL (See Section 3): ________%

MINORITY CONTRACT GOAL AMOUNT (See Section 6): $________
Minority Contract Goal (percent see Section 7): ________%

WOMAN HIRING GOAL (Section 3): ________%

WOMAN CONTRACT GOAL AMOUNT (Section 6): $________
Women Contract Goal (percent see Section 7): ________%

1. DEFINITIONS:

"MINORITY"	BLACKS, HISPANICS, CAPE VERDEANS, ASIAN AMERICANS AND NATIVE AMERICANS.
"AGENCY"	THE MASSACHUSETTS HOUSING FINANCE AGENCY
"DEVELOPER"	See Above
"OWNER"	See Above
"M/WBE"	MINORITY/WOMEN BUSINESS ENTERPRISE
"LIAISON COMMITTEE"	See Section 5A

"EO OFFICER"	EQUAL OPPORTUNITY OFFICER FROM THE EQUAL OPPORTUNI DEPARTMENT OF THE AGENCY
"GOALS"	The numerical percentages for the employment women and minorities. These are goals and c jectives, not quotas. Contractors will not subject to penalty simply because they are unab to attain the enumerated percentages. Rather, t compliance standard will be an evaluation of t efforts they have undertaken to attain the projected levels of employment. The same qualif cation, performance, and employment standards a to be applied to all employees.
"COMPLIANCE STANDARD"	The term "every possible measure" as used here is the standard by which affirmative acti efforts are to be evaluated, means the same as "be efforts" or "good faith efforts" with respect the actions taken by the contractor and includ the obligation of the contractor to provide t Agency with evidence of its compliance.
"COLLECTIVE BARGAINING AGREEMENTS"	Contractors will not be required to violate the lawful collective bargaining agreements to me the affirmative employment goals. In the hiri of journeymen, apprentices, trainees, advanc trainees, and laborers the Contractor and Subco tractors shall rely on referrals generated n only under collective bargaining agreements b also from other sources such as community organiz tions.

2. PARTIES TO THIS CONTRACT

THIS CONTRACT ENTERED INTO ON THE DATE FIRST ABOVE WRITTEN I AND AMONG THE GENERAL CONTRACTOR (hereinafter TH "CONTRACTOR"), THE MORTGAGOR (hereinafter THE "OWNER"), AN THE DEVELOPER (all as identified above) and MASSACHUSETT HOUSING FINANCE AGENCY (the "AGENCY"), a body politic an corporate organized pursuant to Chapter 23A Appendix (th "ACT") of the Massachusetts General Laws, (West Edition (the "MGLA").

3. AGREEMENT.

DURING THE PERFORMANCE OF THIS CONTRACT, THE CONTRACTOR AND ALL SUBCONTRACTORS (hereinafter colleactively referred to as the "CONTRACTOR" unless otherwise mentioned individually), the ASSIGNEES, AND SUCCESSORS IN INTEREST, AGREE AS FOLLOWS:

A. TO ABIDE BY THE PROVISIONS OF EXECUTIVE ORDER 11246 AND TO INCORPORATE THE ORDER IN ALL NON-EXEMPT CONTRACTS ENTERED INTO.

B. THE CONTRACTOR SHALL NOT DISCRIMINATE AGAINST ANY EMPLOYEE, OR APPLICANT FOR EMPLOYMENT BECAUSE OF RACE, COLOR, RELIGION, CREED, NATIONAL ORIGIN, AGE, SEX OR HANDICAPPED STATUS. THIS INCLUDES, BUT IS NOT LIMITED TO THE FOLLOWING:

   i) ADVERTISING; RECRUITMENT; LAYOFF; TERMINATION; RATES OF PAY OR OTHER FORMS OF COMPENSATION; CONDITIONS OR PRIVILEGES OF EMPLOYMENT; AND SELECTION FOR APPRENTICESHIP. THE CONTRACTOR SHALL POST HEREAFTER IN CONSPICUOUS PLACES, AVAILABLE FOR EMPLOYEES AND APPLICANTS FOR EMPLOYMENT, NOTICES TO BE PROVIDED BY THE AGENCY SETTING FORTH LAW OF THE COMMONWEALTH (M.G.L. CHAPTER 151(B) AND EXECUTIVE ORDERS 227 AND 237; and

C. THE CONTRACTOR SHALL UNDERTAKE AFFIRMATIVE ACTION MEASURES DESIGNED TO ELIMINATE ANY DISCRIMINATORY BARRIERS IN THE TERMS AND CONDITIONS OF EMPLOYMENT and UTILIZATION OF SERVICES AND TO ELIMINATE AND REMEDY ANY EFFECTS OF PAST DISCRIMINATION.

   i) SUCH AFFIRMATIVE ACTION SHALL ENTAIL POSITIVE AND AGGRESSIVE MEASURES TO ENSURE EQUAL OPPORTUNITY IN THE AREAS OF HIRING, UPGRADING, DEMOTION OR TRANSFER, RECRUITMENT, LAYOFF OR TERMINATION, RATE OF COMPENSATION, AND INSERVICE OR APPRENTICESHIP TRAINING PROGRAMS.

D. THIS CONTRACT WILL BE ATTACHED AND INCLUDED BY REFERENCE INTO THE GENERAL CONSTRUCTION CONTRACT AND ALL SUBCONTRACTS FOR CONSTRUCTION AND/OR SERVICES. EACH SUBCONTRACTOR OR SUPPLIER/BIDDER SHALL BE BOUND TO THE SAME EQUAL OPPORTUNITY AND AFFIRMATIVE ACTION OBLIGATIONS AS THE GENERAL CONTRACTOR.

4. **GOALS**

A. ON THIS DEVELOPMENT, THE CONTRACTOR SHALL MAINTAIN:

i) A MINORITY HIRING PERCENTAGE GOAL OF ___%. THIS GOAL REPRESENTS THE RATIO OF MINORITY EMPLOYEE WORK HOURS TO TOTAL EMPLOYEE WORK HOURS IN EACH CATEGORY; AND

ii) A WOMAN HIRING PERCENTAGE GOAL OF __%. THIS GOAL REPRESENTS THE RATIO OF WOMAN EMPLOYEE WORK HOURS TO TOTAL EMPLOYEE WORK HOURS IN EACH CATEGORY.

THESE GOALS WILL INCLUDE, BUT NOT BE LIMITED TO, THOSE "CLASSES of WORK" LISTED IN SECTION 44C OF CHAPTER 149 OF THE MGLA.

B. FOR THE HIRING OF MINORITY AND WOMEN WORKERS, APPRENTICES, TRAINEES AND ADVANCED TRAINEES, THE CONTRACTOR SHALL RELY ON THE FOLLOWING REFERRALS:

i) FROM TRADITIONAL SOURCES UTILIZED BY THE CONSTRUCTION INDUSTRY; and

ii) FROM AGENCIES DESIGNATED BY THE LIAISON COMMITTEE OR THE AGENCY.

5. **EQUAL OPPORTUNITY REQUIREMENTS**

A. FOR THE LIFE OF THIS CONTRACT THE AGENCY MAY REQUIRE A LIAISON COMMITTEE. THE LIAISON COMMITTEE MAY BE COMPOSED OF REPRESENTATIVES FROM THE DEVELOPER, THE OWNER, THE AGENCY, MINORITY AND WOMEN COMMUNITY ORGANIZATIONS, (TO BE DESIGNATED BY THE AGENCY), AND AS REQUIRED, THE STATE OFFICE OF MINORITY AND WOMEN BUSINESS ASSISTANCE (SOMBA).

B. THE CONTRACTOR AND THE DESIGNATED ON-SITE EQUAL EMPLOYMENT OPPORTUNITY OFFICER FOR THE CONSTRUCTION COMPANY, IF ANY, SHALL RECOGNIZE THE LIAISON COMMITTEE AS A RESOURCE TO ASSIST WITH FULFILLING AFFIRMATIVE ACTION GOALS. ALL MATTERS RELATING TO THE RECRUITMENT, REFERRAL, EMPLOYMENT AND TRAINING OF MINORITIES AND WOMEN WILL BE REFERRED TO THE LIASON COMMITTEE.

C. THE CONTRACTOR AGREES TO HIRE APPRENTICES IN EACH TRADE. THE NUMBER OF HOURS OF APPRENTICES EMPLOYED SHALL AT LEAST MEET THE MINIMUM RATIO OF APPRENTICES TO "JOURNEYMAN" HOURS IN EACH TRADE AS SPECIFIED IN THE JOINT APPRENTICESHIP COMMITTEE AGREEMENT. TWENTY-FIVE PERCENT (25%) OF SUCH APPRENTICES IN EACH TRADE SHALL

BE IN THEIR FIRST YEAR OF TRAINING.

6. REPORTING

A. THE CONTRACTOR SHALL PREPARE PROJECTED MANNING TABLES ON A QUARTERLY BASIS. THESE TABLES SHALL BE BROKEN DOWN BY WEEK, OF WORKHOURS REQUIRED IN EACH TRADE. COPIES OF ALL TABLES SHALL BE FURNISHED TO THE AGENCY AND THE LIAISON COMMITTEE A WEEK IN ADVANCE OF THE COMMENCEMENT OF THE PERIOD COVERED. THE TABLES ARE TO BE SUBMITTED AS UPDATED. NO CONTRACTOR IS TO INITIATE WORK ON THE SITE UNTIL COMPLIANCE OF THIS SECTION HAS BEEN COMPLETED.

B. RECORDS OF EMPLOYMENT REFERRAL ORDERS, PREPARED BY THE CONTRACTOR, SHALL BE MADE AVAILABLE TO THE AGENCY AND/OR TO THE LIAISON COMMITTEE ON REQUEST.

C. THE CONTRACTOR SHALL PREPARE REPORTS ON FORMS FURNISHED BY THE AGENCY. THESE REPORTS WILL LIST THE HOURS WORKED IN EACH TRADE BY EACH EMPLOYEE. EACH EMPLOYEE SHALL BE IDENTIFIED AS i) MINORITY, ii) NON-MINORITY AND/OR iii) WOMAN.

D. COPIES OF THESE REPORTS SHALL BE DELIVERED TO THE AGENCY (AND WHEN APPLICABLE, TO THE LIAISON COMMITTEE) ON OR BEFORE THE 10TH DAY OF EACH MONTH TOGETHER WITH THE REQUISITION FOR FUNDS, OR AT SUCH OTHER TIME REQUIRED BY THE AGENCY.

7. STANDARD of COMPLIANCE AND APPROVAL

A. THE CONTRACTOR SHALL TAKE AFFIRMATIVE ACTION USING EVERY POSSIBLE MEASURE TO INVOLVE MINORITY AND WOMEN SUBCONTRACTORS (M/WBE) IN ALL SUB-BID WORK. THIS AFFIRMATIVE ACTION SHALL COVER BOTH PRE-BID AND POST-BID PERIODS. WHILE BIDS ARE IN PREPARATION, THE CONTRACTOR SHALL NOTIFY THE STATE OFFICE OF MINORITY AND WOMEN BUSINESS ASSISTANCE, OR ITS DESIGNEE, OF ALL WORK, SERVICES AND SUPPLIES FOR WHICH THE CONTRACTOR INTENDS TO NEGOTIATE BIDS. THE CONTRACTOR SHALL TAKE AFFIRMATIVE ACTION TO REACH THE DOLLAR AMOUNTS SET FORTH ABOVE:

i) \$____________________% FOR MBE; AND

ii) \$____________________% FOR WBE.

In the event these goals are not met the contractor must demonstrate that minority or female-owned firms are not available to bid competitively in the applicable sub-trade classification. Where a subcontractor awards work to a lower-tier subcontractor he or she shall be subject to this provision, and the same percentage goals applicable to the general contractor shall apply to him.

B. AS SOON AS PRACTICAL IN THE SUBCONTRACTING PROCESS, AND PRIOR TO THE FINAL SELECTION OF SUBCONTRACTORS AND AWARD OF SUBCONTRACTS, NO LATER THAN THE EQUAL OPPORTUNITY PRECONSTRUCTION CONFERENCE, THE GENERAL CONTRACTOR WILL SUBMIT IN WRITING TO THE AGENCY (OR BY TELEPHONE, CONFIRMED IN WRITING), THE FOLLOWING INFORMATION:

THE EFFORTS EMPLOYED TO SOLICIT BIDS FROM MINORITY/WOMAN SUBCONTRACTORS; AND

(ii) THE DOLLAR AMOUNTS OF THE BIDS AWARDED TO MINORITY WOMAN SUBCONTRACTORS; AND

(iii) THE AMOUNTS OF THE FINAL ACCEPTED CONTRACTS; AND

(iv) THE REASON FOR DECLINING THE BID OF A MINORITY OR WOMAN SUBCONTRACTOR.

C. PRIOR TO THE INITIAL CONSTRUCTION LOAN CLOSING, THE EO OFFICER MUST APPROVE IN WRITING THE AFFIRMATIVE ACTION EFFORT OF THE CONTRACTOR. THE FOLLOWING LISTS MUST BE SUBMITTED:

(i) FIRMS TO WHICH SUBCONTRACTS HAVE BEEN AWARDED; AND

(ii) FIRMS TO WHICH EXECUTED LETTERS OF INTENT HAVE BEEN SENT; AND

(iii) FIRMS WITH WHICH VERBAL COMMITMENTS HAVE BEEN MADE.

8. PREFERENCE

IN THE EMPLOYMENT OF MECHANICS, APPRENTICES, TRAINEES AND ADVANCED TRAINEES, THE CONTRACTOR SHALL GIVE PREFERENCE:

(i) TO CITIZENS OF THE COMMONWEALTH WHO HAVE SERVED IN THE ARMED FORCES OF THE UNITED STATES IN TIME OF WAR AND HAVE BEEN HONORABLY DISCHARGED OR RELEASED FROM ACTIVE DUTY, AND WHO ARE QUALIFIED TO PERFORM THE WORK TO WHICH THE EMPLOYMENT RELATES; and

(ii) TO RESIDENTS OF THE COMMONWEALTH GENERALLY, AND,

IF SUCH CANNOT BE OBTAINED IN SUFFICIENT NUMBERS, THEN TO RESIDENTS OF THE UNITED STATES.

9. RIGHT of ACCESS

A DESIGNEE OF THE AGENCY AND A DESIGNEE OF THE LIAISON COMMITTEE (WHERE APPLICABLE) SHALL EACH HAVE THE RIGHT OF ACCESS TO THE CONSTRUCTION SITE.

10. COMPLIANCE WITH REQUIREMENTS

THE CONTRACTOR WILL COMPLY WITH THE PROVISIONS OF EXECUTIVE ORDERS 227 AND 237 OF THE GOVERNOR'S CODE OF FAIR PRACTICES, AND OF CHAPTER 151B, AS AMENDED, OF THE MGLA, EACH INCORPORATED HEREIN BY REFERENCE AND MADE A PART OF THIS CONTRACT.

11. DURATION OF NON-DISCRIMINATION

THE CONTRACTOR, IN THE PERFORMANCE OF ALL WORK AFTER AWARD, AND PRIOR TO COMPLETION OF THE CONTRACT WORK, WILL NOT ILLEGALLY DISCRIMINATE IN EMPLOYMENT PRACTICES, OR IN PROCUREMENT OF MATERIALS AND RENTALS OF EQUIPMENT.

12. COMPLIANCE INFORMATION AND REPORTS

A. THE CONTRACTOR WILL PROVIDE ALL INFORMATION AND REPORTS REQUIRED BY THE OWNER OR THE AGENCY, AND WILL PERMIT ACCESS TO ITS FACILITIES AND ANY BOOKS, RECORDS, ACCOUNTS AND OTHER SOURCES OF INFORMATION RELATIVE TO THE REQUIREMENTS OF THIS CONTRACT. WHERE INFORMATION REQUIRED IS IN THE EXCLUSIVE POSSESSION OF ANOTHER WHO FAILS, OR REFUSES TO FURNISH THIS INFORMATION, THE CONTRACTOR SHALL CERTIFY TO THE OWNER AND THE AGENCY AND SHALL DETAIL EFFORTS TO OBTAIN THE INFORMATION.

B. THE OWNER, THE CONTRACTOR, AND THE DEVELOPER SHALL NOT ENTER INTO ANY AGREEMENT, FORMAL OR INFORMAL, WRITTEN OR VERBAL, WHICH WOULD DIRECTLY OR INDIRECTLY HAVE THE EFFECT OF REDUCING, MODIFYING, OR OTHERWISE CHANGING THE TERMS AND CONDITIONS CONTAINED IN THIS CONTRACT.

C. WHENEVER THE OWNER OR DEVELOPER SUBMITS A REQUISITION TO THE AGENCY FOR A PROGRESS PAYMENT FOR WORK PERFORMED, THE REQUISITION SHALL INCLUDE COPIES OF AFFIDAVITS OF THE COMPLETED MINORITY AND/OR WOMEN BUSINESS UTILIZATION PROGRESS PAYMENT REPORTS (ATTACHMENT 181-3A).

D. FORM 181-1 IS TO BE SUBMITTED BY THE 10TH DAY OF EACH MONTH (ATTACHMENT 181-1).

13. PENALTIES FOR NON-REPORTING

A. THE THE AGENCY MAY, IN ITS SOLE DISCRETION, IMPOSE A PENALTY OF $50.00 PER DAY FOR EACH DAY THAT THERE IS A FAILURE TO SUBMIT FORM 181-3A BY THE GENERAL CONTRACTOR, OWNER OR DEVELOPER WITH THE MONTHLY REQUISITION. EACH OWNER/DEVELOPER OR GENERAL CONTRACTOR SHALL HAVE TEN (10) DAYS IN WHICH TO SUBMIT FORM 181-3A FOLLOWING NOTICE FROM THE AGENCY'S EQUAL OPPORTUNITY OFFICER BEFORE THE $50.00 PER DAY PENALTY IS IMPOSED BY THE AGENCY. $50.00 PER DAY WILL BE DEPOSITED IN AN ESCROW ACCOUNT FOR EACH DAY OF NON-COMPLIANCE FOR EACH VIOLATION. IF THE REPORTS HAVE NOT BEEN ACCEPTED BY THE AGENCY, ON THE 45TH DAY FOLLOWING THE IMPOSITION OF THE PENALTY FOR FAILURE TO REPORT, THE FUNDS COLLECTED FOR THE PENALTY WILL BE RETAINED BY THE AGENCY IN THE FORM OF LIQUIDATED DAMAGES AND DEDUCTED FROM THE PROJECT ACCOUNT.

B. IF THE GENERAL CONTRACTOR, OWNER OR DEVELOPER, AS APPLICABLE, FAILS TO SUBMIT MHFA FORM 181-1 BY THE 10TH DAY OF EACH MONTH, THEN THAT FIRM SHALL BE SUBJECT TO A $50.00 PER DAY PENALTY FOR EACH DAY THAT THE FORM HAS NOT BEEN FILED. EACH OWNER/DEVELOPER OR GENERAL CONTRACTOR SHALL HAVE TEN (10) DAYS IN WHICH TO SUBMIT FORM 181-1, FOLLOWING NOTICE FROM THE AGENCY'S EQUAL OPPORTUNITY OFFICER BEFORE THE $50.00 PER DAY PENALTY IS IMPOSED BY THE AGENCY. FIFTY DOLLARS ($50.00) PER DAY WILL BE DEPOSITED IN AN ESCROW-ACCOUNT FOR EACH DAY OF NON-COMPLIANCE, FOR EACH VIOLATION. IF THE REPORT(S) HAVE NOT BEEN ACCEPTED BY THE AGENCY ON THE 45TH DAY FOLLOWING THE IMPOSITION OF THE PENALTY FOR FAILURE TO REPORT, THE FUNDS IN THE ESCROW ACCOUNT WILL BE RETAINED BY THE AGENCY, IN THE FORM OF LIQUIDATED DAMAGES AND DEDUCTED FROM THE PROJECT ACCOUNT.

14. DETERMINATION OF NON-COMPLIANCE: i) WITH MINORITY/WOMEN HIRING AND ii) GOAL TO USE MINORITY/WOMEN BUSINESS ENTERPRISE

A. WHENEVER THE AGENCY EQUAL OPPORTUNITY OFFICER (HEREINAFTER REFERRED TO AS THE "EO OFFICER") BELIEVES THAT THE CONTRACTOR OR ANY OF ITS SUBCONTRACTORS, MAY NOT BE OPERATING IN COMPLIANCE WITH THIS PROVISION, THE EO OFFICER SHALL CONDUCT AN INVESTIGATION OR CAUSE SUCH AN INVESTIGATION TO BE CONDUCTED.

B. IF THE EO OFFICER DETERMINES THAT THE CONTRACTOR OR SUBCONTRACTOR HAS TAKEN EVERY POSSIBLE MEASURE TO ACHIEVE THE AFFIRMATIVE ACTION REQUIREMENTS UNDER THIS CONTRACT, THE EO OFFICER SHALL FIND THE CONTRACTOR, OR SUBCONTRACTOR, IF APPLICABLE, TO BE IN COMPLIANCE. THE EO OFFICER SHALL ISSUE ITS FINDING IN WRITING, SETTING FORTH A SUMMARY OF THE FACTS AND REASONS ON WHICH THE FINDING IS BASED. COPIES OF THE FINDING AND SUMMARY SHALL BE SENT TO THE OWNER, THE DEVELOPER, THE CONTRACTOR, AND TO THE SUBCONTRACTOR, AS APPLICABLE.

C. IF THE EO OFFICER FINDS AN OWNER, DEVELOPER, CONTRACTOR OR SUBCONTRACTOR TO BE IN PRELIMINARY NONCOMPLIANCE WITH ANY OF THE REQUIREMENTS OF THIS CONTRACT, A WRITTEN NOTICE WILL BE SENT TO THE OWNER, THE DEVELOPER, CONTRACTOR, OR SUBCONTRACTOR, AS APPLICABLE, REQUIRING THE OWNER AND THE DEVELOPER, CONTRACTOR AND SUBCONTRACTOR, AS APPLICABLE, TO MEET WITH THE EO OFFICER OR HIS/HER DESIGNEE TO FORMULATE A CORRECTIVE ACTION PLAN. THE PLAN SHALL INCLUDE A TIMETABLE, ACCEPTABLE TO THE EO OFFICER, INDICATING THE DATE BY WHICH COMPLIANCE SHALL BE ACHIEVED. THE PLAN MAY ALSO INCLUDE ANY OTHER PROVISION WHICH THE EO OFFICER, WHICH HIS/HER SOLE DISCRETION, DEEMS ADVISABLE. THE OWNER, THE DEVELOPER, CONTRACTOR AND SUBCONTRACTOR (IF APPLICABLE), SHALL COMPLY IN FULL WITH THE PROVISIONS OF AN EO OFFICER APPROVED PLAN. IT IS THE RESPONSIBILITY OF THE EO OFFICER OR HIS/HER DESIGNEE TO MONITOR THE QUALITY OF THE CONTRACTOR/SUBCONTRACTOR IMPLEMENTATION OF THE CORRECTIVE ACTION PLAN. IN MAKING A COMPLIANCE DETERMINATION, THE EO OFFICER MUST MAKE A FINDING OF THE RESPONSIVENESS TO THE CORRECTIVE ACTION PLAN OF THE OWNER, THE DEVELOPER, CONTRACTOR, AND/OR SUBCONTRACTOR WITH REGARD TO:

(i) QUALITY OF EFFORT; AND

(ii) NUMERICAL PERFORMANCE,

THE EO OFFICER SHALL ISSUE A WRITTEN DECISION REGARDING THE MANNER IN WHICH THE CONTRACTOR OR SUBCONTRACTOR HAS ADHERED TO THE CORRECTIVE ACTION PLAN AND WHETHER THE CONTRACTOR OR SUBCONTRACTOR IS IN COMPLIANCE. THE DECISION WILL SET FORTH A SUMMARY OF THE FACTS AND REASONS ON WHICH THE DETERMINATION IS BASED. COPIES OF THE DECISION SHALL BE SENT TO THE OWNER AND DEVELOPER, CONTRACTOR OR SUBCONTRACTOR, AS APPLICABLE.

D. IF THE EO OFFICER FINDS CAUSE TO BELIEVE THAT THE CONTRACTOR OR SUBCONTRACTOR, AS APPLICABLE, HAS NOT ADHERED TO THE CORRECTIVE ACTION PLAN OR IS OTHERWISE IN NONCOMPLIANCE, THE EO OFFICER SHALL IN WRITING NOTIFY THE OWNER AND THE DEVELOPER, THE CONTRACTOR AND THE SUBCONTRACTOR, AS APPLICABLE. IF THE EO OFFICER DETERMINES THAT THE OWNER, THE DEVELOPER, CONTRACTOR AND/OR SUBCONTRACTOR, HAS NOT ADHERED TO THE CORRECTIVE ACTION PLAN AND IS IN NONCOMPLIANCE, THE EO OFFICER SHALL, WITH NOTICE TO THE OWNER AND THE DEVELOPER, CONTRACTOR OR SUBCONTRACTOR, AS APPLICABLE, RECOMMEND TO THE EXECUTIVE DIRECTOR OF THE AGENCY THE IMPOSITION OF THE PENALTIES FOR NONCOMPLIANCE ALLOWED IN THIS CONTRACT AND WHICH SHALL BE DEPOSITED IN AN ESCROW ACCOUNT UNTIL SAID OWNER, DEVELOPER, CONTRACTOR OR SUBCONTRACTOR IS IN COMPLIANCE WITH THIS CONTRACT. THE ESCROWED FUNDS SHALL BE DEDUCTED FROM LOAN FUNDS AVAILABLE FOR THE DEVELOPMENT.

15. PENALTIES FOR NONCOMPLIANCE

THE AMOUNT TO BE ESCROWED SHALL BE DETERMINED AS FOLLOWS:

A. IF AFTER TEN (10) DAYS AFTER NOTIFICATION BY THE EO OFFICER, THE OWNER, THE DEVELOPER AND/OR THE GENERAL CONTRACTOR IS IN NONCOMPLIANCE WITH THE REQUIREMENTS OF THIS CONTRACT, NOT MORE THAN ONE-TENTH (1/10) OF ONE PERCENT (1%) OF THE CONTRACT PRICE, PER VIOLATION, FOR EACH WEEK THAT THE CONTRACTOR HAS FAILED OR REFUSED TO COMPLY; OR

B. IF A SUBCONTRACTOR HAS NOT ADHERED TO A CORRECTIVE ACTION PLAN AND REMAINS IN NONCOMPLIANCE WITH THE REQUIREMENTS OF THIS CONTRACT, A SUM OF NOT MORE THAN ONE PERCENT (1%) OF THE SUBCONTRACT PRICE, PER VIOLATION, FOR EACH WEEK THAT THE SUBCONTRACTOR HAS FAILED OR REFUSED TO COMPLY.

16. RELEASE OF ESCROWED FUNDS

A. NO FUNDS PLACED IN ESCROW IN ACCORDANCE WITH THE RECOMMENDATION OF THE EO OFFICER BY THE AGENCY DIRECTOR SHALL BE RELEASED BY THE AGENCY TO THE DEVELOPER, CONTRACTOR OR SUBCONTRACTOR UNTIL THE AGENCY DIRECTOR HAS CONSULTED WITH THE EO OFFICER TO DETERMINE THAT THE OWNER, THE DEVELOPER, CONTRACTOR, AND/OR SUBCONTRACTOR, AS APPLICABLE, IS IN COMPLIANCE WITH THIS CONTRACT.

B. IF, WHEN THE WORK UNDER THE CONTRACT IS SUBSTANTIALLY COMPLETE, THE AGENCY DIRECTOR HAS NOT RELEASED FUNDS PLACED IN ESCROW PURSUANT TO THIS PROVISION, SUCH FUNDS SHALL BE DEEMED LIQUIDATED DAMAGES, RELEASED FROM THE ESCROW TO THE AGENCY AND NOT DISTRIBUTED TO THE OWNER.

17. RIGHT OF APPEAL

A. WITHIN FIVE (5) DAYS AFTER RECEIVING NOTICE THAT FUNDS ARE TO BE PLACED IN ESCROW PURSUANT TO THIS CONTRACT, THE OWNER, DEVELOPER, CONTRACTOR, OR SUBCONTRACTOR, IF APPLICABLE, MAY APPEAL PURSUANT TO THE PROVISIONS OF EXECUTIVE ORDER # 227 OR SUCCESSIVE EXECUTIVE ORDERS.

B. IN ADDITION TO THE PENALTIES THAT MAY BE IMPOSED BY THE AGENCY ALREADY HEREIN STATED, THE AGENCY MAY, AFTER THE ISSUANCE OF FINAL REPORT OF NON-COMPLIANCE IMPOSE ONE OR MORE OF THE FOLLOWING PENALTIES ON THE CONTRACTOR AS IT MAY DEEM APPROPRIATE TO ATTAIN FULL AND EFFECTIVE ENFORCEMENT OF THIS CONTRACT:

(i) THE AGENCY MAY EXCLUDE THE CONTRACTOR FROM PARTICIPATION IN ANY AGENCY FINANCED PROGRAMS FOR A SPECIFIED PERIOD OF TIME, COMMENSURATE WITH THE SERIOUSNESS OF THE BREACH OF EQUAL OPPORTUNITY/ AFFIRMATIVE ACTION CONSTRUCTION PROVISIONS GENERALLY NOT TO EXCEED FIVE (5) YEARS. HOWEVER, THE AGENCY MAY EXCLUDE A PARTY FOR AN INDEFINITE PERIOD BECAUSE OF A DELIBERATE AND WILLFUL, VIOLATION OF THIS CONTRACT.

(ii) THE AGENCY MAY DISQUALIFY THE CONTRACTOR TEMPORARILY FROM PARTICIPATION IN AGENCY FINANCED PROGRAMS UNTIL THE AGENCY, IN ITS SOLE DISCRETION, IS SATISFIED THAT SUFFICIENT STEPS HAVE BEEN IMPLEMENTED BY A CONTRACTOR TO REMEDY VIOLATIONS OF THE EQUAL OPPORTUNITY/ AFFIRMATIVE ACTION CONSTRUCTION PROVISIONS.

18. OWNER/DEVELOPER OBLIGATIONS

BEFORE THE LEGAL ENTITY WHICH IS TO BE THE OWNER/MORTGAGOR HAS BEEN FORMED, THE DEVELOPER ENTITY MAY HAVE AGREED TO THE PROVISIONS OF THIS CONTRACT. IN SUCH CASES, THE OBLIGATIONS OF THE DEVELOPER MUST BE ASSUMED BY THE OWNER. IN INSTANCES WHERE THERE IS A CONSULTANT OPERATING AS A DEVELOPER, BOTH THE OWNER AND THE DEVELOPER MUST AGREE AND COMPLY WITH THIS CONTRACT. THE OWNER HAS PRIMARY RESPONSIBILITY FOR COMPLYING WITH THIS CONTRACT.

A. IN ADDITION TO ANY OTHER OBLIGATIONS OF THE OWNER UNDER ANY PRECEDING SECTION, THE OWNER AGREES TO MONITOR, ENSURE AND ENFORCE FULL COMPLIANCE BY ITS GENERAL CONTRACTOR AND ALL SUBCONTRACTORS WITH THIS CONTRACT. THE OWNER AGREES TO FURNISH, OR TO CAUSE ITS CONTRACTORS, SUBCONTRACTORS, OR VENDORS, AS APPLICABLE, TO FURNISH SUCH INFORMATION AS THE EO OFFICER MAY REQUIRE FOR REVIEW OF SUCH COMPLIANCE, AND TO ALLOW AUTHORIZED REPRESENTATIVES OF THE EO OFFICER FULL ACCESS TO THE JOB SITE AND TO EMPLOYEES WORKING ON THE JOB SITE. THE OWNER AGREES TO TAKE SUCH ACTION WITH RESPECT TO ANY CONTRACTOR OR SUBCONTRACTOR AS THE AGENCY MAY DIRECT AS A MEANS OF ENFORCING THIS CONTRACT.

B. DURING THE TERM OF THE CONSTRUCTION CONTRACT, THE OWNER AGREES TO INCLUDE THIS PROVISIONS OF THIS CONTRACT IN EVERY CONTRACT, SUBCONTRACT, OR PURCHASE ORDER ENTERED INTO UNDER THE CONTRACT AND IN ANY REQUESTS FOR PROPOSALS OR SIMILAR SOLICITATIONS MADE IN CONNECTION WITH SUCH CONTRACTS, SUBCONTRACTS OR PURCHASE ORDERS.

C. WHEN CONTRACT WORK IS SUBSTANTIALLY COMPLETED, THE OWNER SHALL DELIVER TO THE EO OFFICER A SWORN CERTIFICATION THAT ALL REQUIREMENTS OF THIS CONTRACT HAVE BEEN FULFILLED DURING PERFORMANCE OF THE CONTRACT. THE EO OFFICER MAY REQUEST FROM THE OWNER SUCH ADDITIONAL INFORMATION AS SHE/HE DEEMS NECESSARY TO DEMONSTRATE SUCH COMPLIANCE. PRIOR TO PAYMENT OF THE FINAL REQUISITION, THE EO OFFICER SHALL DETERMINE WHETHER THE OWNER HAS COMPLIED WITH THE APPLICABLE REQUIREMENTS OF THIS CONTRACT. IF EO OFFICER FINDS THE OWNER HAS NOT SO COMPLIED, THE EO OFFICER MAY RECOMMEND THAT THE AGENCY DIRECTOR WITHHOLD SAID PAYMENT FROM THE OWNER FOR THE FOLLOWING:

(i) ANY AMOUNTS WHICH THE EO OFFICER PREVIOUSLY RECOMMENDED BE SUSPENDED OR PLACED IN ESCROW UNDER; AND/OR

(ii) LIQUIDATED DAMAGES IN AMOUNTS UP TO $2,000, PERVIOLATION, FOR EACH WEEK THAT THE OWNER OR ANY CONTRACTOR OR SUBCONTRACTOR HAS NOT COMPLIED.

19. GENERAL PROVISIONS

A. THE SECTIONS OF THIS CONTRACT ARE SEVERABLE, AND IF ANY OF THESE SECTIONS SHALL BE HELD UNCONSTITUTIONAL BY ANY COURT OF COMPETENT JURISDICTION, THE DECISION OF SUCH COURT SHALL NOT AFFECT OR IMPAIR ANY OF ANY OF THE REMAINING SECTIONS.

B. ALL DECISIONS AND DETERMINATIONS BY THE EO OFFICER SHALL BE FINAL AND NOT SUBJECT TO CONTEST EXCEPT AS PROVIDED ABOVE BY THE OWNER, CONTRACTOR OR SUBCONTRACTOR; PROVIDED, HOWEVER, THAT AFTER AN EO OFFICER DECISION OR DETERMINATION HAS BEEN MADE, THE AGENCY DIRECTOR UPON THE REQUEST OF THE OWNER OR CONTRACTOR, MAY REVISE, AMEND OR OTHERWISE ALTER THE EO OFFICER DECISION OR DETERMINATION.

C. THE OWNER, GENERAL CONTRACTOR AND ALL SUBCONTRACTORS AGREE TO FULLY COMPLY WITH RULES, REGULATIONS AND AGENCY POLICIES WHICH HAVE BEEN ADOPTED OR ARE PROMULGATED BY THE AGENCY, FROM TIME TO TIME. NOTICE OF ANY CHANGES IN AGENCY RULES, REGULATIONS OR POLICIES, WHICH IMPACT ON THIS CONTRACT, SHALL BE PROVIDED TO THE OWNER, GENERAL CONTRACTOR OR A SUBCONTRACTOR AS REQUIRED.

THE PARTIES HERETO HAVE EXECUTED THIS EQUAL OPPORTUNITY/AFFIRMATIVE ACTION CONTRACT for CONSTRUCTION THE DATE FIRST ABOVE WRITTEN UNDER SEAL BY THEIR DULY AUTHORIZED REPRESENTATIVES.

OWNER:

BY______________________________

DEVELOPER:

BY______________________________

CONTRACTOR:

BY______________________________

MASSACHUSETTS HOUSING FINANCE AGENCY

____
Date

BY______________________________
Glendora Mc Ilvain Putnam,
Equal Opportunity Officer

EXHIBIT A-RE: FORMS REQUIRED TO BE FILED MONTHLY WITH REQUISITION

OFFICIAL USE
NHFA ONLY

PROJECT NAME____________________

NHFA #______________

REQ. DATE: From_______ To_______, 19___.

TRADE	SUB-CONTRACTOR NAME SELECTED	$ VALUE AWARDED	$ EARNED TO DATE	(-) RETAINAGE	TOTAL PAID	CURRENT PAYMENT DUE
TOTAL						

SWORN TO BY:

____
Signature

____
Contractor (Name & Title)

____
Date

SUBMIT Five COPIES OF THIS REPORT TO DESIGN & TECHNICAL DEPT. ATTACHED TO Each REQUISITION

NHFA 101-3-A

MASSACHUSETTS HOUSING FINANCE AGENCY

CONTRACTORS AFFIDAVIT THAT ALL CONTRACTORS, SUPPLIERS AND MECHANICS HAVE BEEN PAID

TO: MASSACHUSETTS HOUSING FINANCE AGENCY

The undersigned hereby ceritfies that he is________________
(Title)

of__________________________________
(Contractor entity)

and further cretifies that as of todays date monies previously advanced pursuant to requisitions of the mortgage loan on the Project know as ____
____

(MHFA project# __________________________________)

have been paid or are being held and will be paid to the subcontractors, or suppliers, that there are no further amounts owing to the knowledge of the undersigned other than as set forth in the current requisition, and that only materials, fixtures, and equipment to which the undersigned has absolute title have been used in this project. The following list are those subcontractors or suppliers for which monies have been held for more than 30 days and the amount held.

Executed this_________ day of _______________________ 19__

By: _______________________________

SUBCONTRACTOR/SUPPLIER	AMOUNT HELD
________________________________	$______________
________________________________	$______________
________________________________	$______________

MASSACHUSETTS HOUSING FINANCE AGENCY
CONTRACTORS MONTHLY STAFFING REPORT

PERIOD STARTING ______________

PERIOD ENDING ______________

CONTRACTOR NAME ______________

PROJECT # ______________ PROJECT NAME ______________ LOCATION ______________

COMPLETED BY ______________

PHONE # ______________

GENERAL CONTRACTOR'S DATA	# EMP.		TOTAL MONTHLY HOURS WORKED	# MIN. EMP.	MONTHLY WORK HOURS								AGGREGATE HOURS TO DATE								
					MINORITY HOURS						FEMALE HRS		TOTAL ALL EMP.	MINORITY HOURS						FEMALE HOU	
	M	F			TOTAL	BLACK	HISP.	ASIAN AMER.	AMER. IND.	%	TOTAL	%		TOTAL	BLACK	HISP.	ASIAN AMER.	AMER. IND.	%	TOTAL	%
Bricklayer & Mason																					
Carpenter																					
Cement Mason																					
Laborer																					
Operating Engineer																					
GENERAL CONTRACTOR'S SUB TOTAL																					
PLUS																					
SUBCONTRACTORS' SUB TOTAL																					
EQUALS																					
PROJECT TOTAL																					

IDENTIFY UNION SUBCONTRACTORS WITH AN ASTERISK (*)

SUBCONTRACTORS' DATA	SUBCONTRACTOR NAME	# EMP		TOTAL MONTHLY HOURS WORKED	# MIN. EMP	MONTHLY WORK HOURS								AGGREGATE HOURS TO DATE								
						MINORITY HOURS						FEMALE HRS		TOTAL ALL EMP.	MINORITY HOURS						FEMALE HOU	
		M	F			TOTAL	BLACK	HISP	ASIAN AMER	AMER. IND.	%	TOTAL	%		TOTAL	BLACK	HISP	ASIAN AMER	AMER IND	%	TOTAL	%
Acoust Ceil.																						
Carpenters																						
Drywall																						
Electricians																						
Elevator Contr.																						
Excavator																						
Flooring																						
Glazing																						
Laborers																						
Lathers																						
Masons																						
Millwork																						
Misc. Iron																						
Painters																						
Paving																						
Pipe Cov & Ins.																						
Plasterers																						
Plumbers																						
Reinfor Steel																						
Roofers																						
Sheet Metal																						
Sprinkler																						
Steamfitters																						
Temp Controls																						
Tile																						
Waterproofing																						
SUBCONTRACTORS' SUB TOTAL																						

MASSACHUSETTS HOUSING FINANCE AGENCY

Note: Items marked with * are not currently required by MHFA but will be required when new HUD guidelines are issued by 1991.

REVISED 10/28/88

PROJECT NAME: ____________________
PROJECT NO: ______________
DATE: ______________

ADDENDUM #1

The following material and construction recommendations have been developed by the Agency through experience with its portfolio to insure a reasonable level of material and construction standards. These are the minimum recommended in these areas and must be included in both Outline Specifications and Closing Specifications and the work included in the contract amount.

If you choose not to follow these recommendations you must submit an additional guarantee in the form of the attached letter.

The new Federal Fair Housing Amendments Act of 1988 will require 100% of all new construction to have Adaptive Design Features. HUD has yet to develop standards for these features effective 1991, but they may not be substantially different then Adaptive Design Features as presently defined in American National Standards Institute (ANSI) A117.1. These requirements should be incorporated at the earliest stages of design development In anticipation of HUD standards. Adaptable Design Features will be required in all units in buildings consisting of four or more units. Accessible routes must be provided in public and common use portions of buildings so that persons with disabilities may be allowed passage into and within all premises and be sufficiently wide to allow passage by persons using wheelchairs in all elevator buildings and ground floors of non elevator buildings. Provisions that anticipate these requirements have been asterisked (*).

Division 1: Testing

Concrete and soil compaction tests shall be performed by a qualified testing lab for all buildings where applicable. Water leakage and/or masonry tests may be required in certain buildings.

Division 2: Site Work

Extruded asphalt curb is not recommended.

Division 3: Concrete

Irregularities in exposed concrete plank ceilings to be filled and finished before painting.

Division 4: Masonry

If aluminum flashing is imbedded in masonry it shall be protected against corrosion by protective coating.

Masonry veneer walls shall be designed and constructed in conformance with the Brick Institute of America Technical Note 28B. This note requires among other items: 9 ga. corrosion resistant wire ties spaced a minimum of 24" on center vertically and horizontally securely attached to the stud for all veneer construction above 3 stories, air space be a minimum of 1" and be kept clear of mortar droppings, and flashing be provided at all horizontal surfaces including floor lines.

Gypsum sheathed backup walls shall be covered with 15# felt or have all penetrations and joints in the waterproof paper coating covered with mastic waterproofing.

Division 6A: Rough Carpentry

Wood product sheathing shall be installed in strict accordance with manufacturers exposure, spacing and span ratings and shall be stamped by a recognized agency to show those ratings.

(*) Blocking of all bathrooms should be installed for the later installation of grab bars in conformance with ANSI A117.1

Division 6B: Finish Carpentry and Millwork

MHFA recommends a durable, cleanable finish on cabinets. Currently recommended are high pressure laminate applied to high-density particle board or wood veneer with a durable finish. Low pressure laminate, vinyl or equivalent is not recommended. The following are material and construction guidelines.

1.Cabinet drawers must be full-length (minimum of 18"). Drawers must be designed with a durable, full-length, side-mounted, double runner suspension system with manual positive stops.Currently recommended is a full-length steel system with nylon wheels. Monorail systems are not recommended (with the exception of the Accuride 42 ball bearing system).

2.Drawer bottoms must have a minimum thickness of: 1/8" tempered hardboard or plywood, or 1/4" hardboard or high-density particle board. Drawer sides must have a minimum thickness of 7/16".

3.Cabinet bottoms must have a minimum thickness of:

1/4"tempered hardboard or plywood, or 3/8" hardboard or high-density particle board. Cabinet sides must have a minimum thickness of 1/2". Toe kicks must be totally enclosed.

4.Wall cabinets must have a minimum of two (2) wood nailing strips (top and bottom). Minimum dimensions for nailers are 3/4" x 1/2".

5.All cabinet interiors must be treated with a water resistant substance.

(*) 6.Removable base cabinets under sinks in kitchens and bathrooms and adjustable worksurfaces of at least 30" in kitchens should be provided in all units. Provisions for adaptable kitchens and bathrooms as defined in ANSI A117.1 should be incorporated in all designs.

Compliance with the above minimum recommendations does not automatically indicate Agency approval. All cabinets are subject to additional review and approval by the Agency.

Adequate storage shall be provided in bathrooms. It is recommended that a vanity with counter sink shall be provided in all unit bathrooms, with the exception of fully accessible handicap units.

Kitchens countertops shall be equipped with a backsplash permanently attached to the countertop.

If a stove top abuts side wall protection must be provided against heat and grease.

Division 7: Thermal & Moisture Protection

Compliance with section 2007 of the Massachusetts State Building Code is taken to mean that wherever the integral vapor barrier is not continuous an additional vapor barrier conforming to the code must be installed.

Thermal insulation to must or exceed Section 2009 for lowrise and Section 2014 for high residential buildings of Massachusetts State Building Code. Calculations may be requested by the Agency to indicate the most cost effective insulation level. The Agency may further recommend insulation on all pipes in unheated spaces and near uninsulated exterior walls to prevent freezing and damage due to condensation and where it is in the project's interest to do so.

For flat roof applications it is recommended that a roofing system be specified that provides a 10 year guarantee by the manufacturer.

Division 8: Doors, Windows & Glass

U value and infiltration rates to meet or exceed recommendations in Section 2009 of Article 20 of Massachusetts State Building Code. Calculations may be requested by the Agency to indicate the most thermally cost effective window type. All aluminum windows shall as a minimum conform to AAMA commercial type and be for wind load based upon AAMA formulae.

For insulating glass, the warranty period is 5 years after seal date permanently imprinted on unit, but not less than 5 years after date of substantial completion.

In compliance with the Massachusetts Sanitary Code, a screen door must be provided at all units entered directly from the exterior.

Minimum recommended thickness of steel door frames is as follows:

1. Interior 18 Ga.
2. Exterior and doors set in masonry 16 Ga.

(*) All doors in public spaces and common use portions of building entrances to all dwelling units should have a minimum clear opening of 32" measured from the face of the door in an open position of 90 degrees to the stop, and be equipped with lever operated, push type, or "U" shaped handles.

Division 9: Finishes

Stud spacing in public areas is recommended to be 16" o.c.

Provide heavy gauge or double stud at doors larger than 2'8".

It is recommended that full height ceramic tile or equivalent shall be provided at all tubs. Bathroom floors are recommended to be either sheet vinyl or ceramic tile.

Kitchen floors are recommended to be sheet vinyl or V.C.T.

Sheet vinyl where provided is recommended to be .085" thick with a .050" wear layer.

V.C.T. where provided is recommended to be a minimum 1/8" thick in conformance with "high traffic" recommendations of HUD MPS.

Paint finish on kitchen and bathroom walls shall be washable.

Where tubs abut corridor or apartment dividing walls, the fire rating of the wall will be maintained below tub rim in compliance with all codes.

Spray on simulated acoustical ceiling is not recommended in areas subject to high moisture such as kitchens and baths.

(*) It is strongly suggested that floors under removable base cabinets in kitchens and bathrooms be installed at initial construction.

Division 10: Specialties

It is recommended that a separate pole and shelf shall be provided in all clothing closets (wood or metal). Integral poles, that allow hanger full bearing, and vinyl-clad wire shelf and pole are also accepted.

Division 11: Equipment

Ranges shall have a minimum size of 24" in one and two bedroom units, and a minimum size of 30" in three and four bedroom units.

Refrigerators shall have a separate freezer door and shall be a minimum size of 12 cu. ft. in one and two bedroom units, and a minimum size of 14 cu. ft. in three and four bedroom units.

(*) Refrigerators with 50% of the freezer space below 54" A.F.F. and 100% of refrigerator space and controls below 54" A.F.F are recommended.

(*) Ranges with front control panel are recommended.

Division 12: FURNISHINGS

Window shades shall be provided at all unit windows and shall meet the Federal Specification F.S. DDD-S-251.

Traverse rods shall be provided at all sliding glass doors.

Carpeting in all units and public spaces is a standard recommendation unless circumstances exist which make an alternate floor covering more appropriate.

Carpeting when provided is recommended to have the following specifications in conformance with HUD Bulletin, UM 44-D:

Use of Type I, Class 2 for unit interiors.

Use of Type II, Class 2 for elderly or handicapped units and public spaces.

Attached are provisions of UM44-D Density for Type I and Type II.

A separate pad in conformance with applicable flame spread and material standards provided in all but handicapped units and public spaces.

Conformance to face weight recommendations of HUD Bulletin UM 44-D is considered minimum acceptable quality.

Division 15A: Plumbing

Water savers and low flow shower heads shall be provided at all units.

Stainless steel sinks and garbage disposals shall be provided in all kitchens.

All sanitary lines below floor slabs shall be cast iron bell and spigot or equal. PVC is not recommended.

All thermal insulation shall meet or exceed recommendations of Section 2010 of the Mass. Building Code. Calculations may be requested by the Agency showing compliance.

The domestic hot water system shall be designed to meet or exceed the recommendations of Section 2010 of the Mass.-Building Code. Calculations may be requested by the Agency showing compliance.

Shower diverter in Handicapped units should be accessible to handicapped seat.

Bathroom sinks and bathtubs shall be equal in durability to enameled steel or cast iron. In particular they shall not be able to be marred or stained by cigarette burns.

Where plastic waste piping is used, expansion joints shall be provided as recommended by the Mass Building Code and protection of expansion joints must be provided to prevent abrasive material from entering joint

Spaces with appliances and equipment that may leak substantial amounts of water such as water heaters and clothes washers shall be provided with a floor drain or floor pan and drain.

Air cushions shall be provided at least every set of fixtures to prevent water hammer. Mechanical shock absorbers shall be provided on all fast acting valves.

Division 15A: PLUMBING

(*) Adjustable fixtures should be provided in compliance with ANSI A117.1. (See sections on Adaptable Bathrooms (4.34. and 4.34.5 and Adaptable Kitchens 4.34.6)

Division 15B: **HVAC**

Thermal insulation shall meet or exceed recommendations of Section 2010 of the Mass. Building Code. Calculations may be requested by the Agency to show compliance.

System design shall meet or exceed the recommendations of Section 2010 of Mass. Building Code. In particular compliance with 2010.5 shall mean a time clock or other device easily controlled by building management to shut of mechanical ventilation when not required. Calculations may be requested by the Agency to show compliance.

Individual apartment thermostats are to be placed accessible in locations, at least 4' above the floor, but no higher than 4'-6".

Provision for air conditioning shall be made in all units. Air conditioning sleeves, if provided, shall be provided with insulating covers.

Central Boiler controls shall allow building management to easily control the following functions:

1. To shut off distribution when outside temperature reaches a preset temperature.

2. To modulate delivered water temperature in response to outside temperature.

3. To modulate delivered water temperature in response to time of day

It is recommended that the heating system be designed so the main heating plant is not used to heat domestic hot water during the summer months

Division 16: ELECTRICAL

All living units shall be individually metered.

All branch circuits shall be wired with copper wire. If aluminum wiring is used in other locations, connections shall be made with appropriate compression fittings.

System design shall meet or exceed the recommendations of Section 2011 and 2012 of the Mass. Building Code.

Disposals shall be wired through a receptacle to provide a means of disconnecting when servicing.

Metal stud partitions shall be grounded in accordance with the Massachusetts Electric Code.

In conformance with section 2013.2.2.3 of the Massachusetts Building Code all exterior lighting shall have an automatic means for nonoperation when natural lighting is available.

(*) All light switches. electrical outlets, thermostats, and other controls should be installed in compliance with ANSI A.117.1.

In accordance with the Energy Conservation Section of the Massachusetts State Building Code, only "I.C." (insulation compatible) rated recessed lighting fixtures are accepted in top floors of insulated ceilings.

It is recommended that the Architect review materials and colors (exterior and interior) subsequent to closing. This review should include such items as cabinet work, flooring, lighting fixtures, wall finishes, masonry/siding, roofing, etc. It is the architect's responsibility to schedule this review prior to the ordering of any finish items. Compliance with the HUD MPS does not necessarily imply MHFA approval.

It is understood that by signing below the above recommended items are included in their entirety in both the Outline Specifications and the Closing Specifications and that the contract amount includes all above items.

SIGNED ____________________

(Architect)

____

(Developer)

____

(Contractor)

Massachusetts Housing Finance Agency
50 Milk St.
Boston, Ma. 02109

Attn. Design and Technical Officer

Re:______________________
____

Gentlemen:

(Owner) requests the use of _(proposed material)_ in lieu of _(original material)_ for _(application)_ in the above referenced project.

(Owner) understands that the use of this building component is contrary to the recommendation of MHFA. _(Owner)_ further understands that if in the opinion of MHFA the component fails to perform its intended function for its normal life during the life of the mortgage that _(Owner)_ will guarantee that they will provide labor and material to insure adequate performance of the component for the remaining life of the mortgage.

(Owner) further promises that in the event it is called upon to perform this guarantee, the funds required shall be obtained from assets or revenue of the partnership other than rental revenue and _(Owner)_ shall not be eligible for any increase in the mortgage amount to cover such cost.

The owner further understands that if this request is made subsequent to loan closing that a credit is due to the project account for the cost differential between the item used and the item proposed.

Very truly yours,

(general partner)

TABLE 2 MINIMUM WEIGHT & DENSITY REQUIREMENTS FOR TYPE 1- SINGLE & MULTI-FAMILY HOUSING

LASS	- TEXTURE	NYLON				POLYPROPYLENE				POLYESTER		ACRYLIC		WOOL	
		BCF*		STAPLE		BCF		STAPLE		STAPLE		STAPLE			
		WT.	DENSITY	WT.	DENSITY	WT.	DENSITY	WT.	DENSITY	WT.	DENSITY	WT.	DENSITY	WT.	DENSITY
Class 1 Moderate Traffic	A. LEVEL OR TEX. LOOP	20	3300	** 22	3450	20	3600	24	4000			33	3350	35	3450
	B. MULTILEVEL	23	2850			24	3400					38	3050	40	2950
	C. PLUSH	24	2600	24	2600							40	2850	42	2700
	D. TWIST	24	2950	24	2950					28	3250	37	3050	38	2950
	E. LEVEL CUT & LOOP	24	3200	24	3200	24	3600			32	3700	37	3300	38	3200
	F. CUT PILE HEAT SET PLIED	24	625	24	625					32	1550	40	2300	42	2400
	G. CUT PILE HEAT SET SINGLES			24	1150					32	2300				
Class 2 Heavy Traffic	A. LEVEL OR TEX. LOOP	26	4000	** 28	4200	26	4350	28	5000			39	4800	40	4550
	B. MULTILEVEL	30	3500			32	3600					45	4200	46	4000
	C. PLUSH	32	3350	32	3350							46	4000	48	3850
	D. TWIST	32	3350	32	3350					36	3900	45	4200	46	4000
	E. LEVEL CUT & LOOP	28	3850	28	3850	28	4000			39	4100	43	4500	45	4350
	F. CUT PILE HEAT SET PLIED	30	1440	30	1440					40	1920	45	2600	46	2650
	G. CUT PILE HEAT SET SINGLES			32	1530					40	2900				

*BCF BULK CONTINUOUS FILAMENT

** FOR BLEND PURPOSES ONLY

TABLE 5 MINIMUM WEIGHT & DENSITY REQUIREMENTS FOR TYPE II ELDERLY & CARE FACILITIES

CLASS	TEXTURE	NYLON				POLYPROPYLENE				POLYESTER		ACRYLIC		WOOL	
		BCF*		STAPLE		BCF		STAPLE		STAPLE		STAPLE			
		WT.	DENSITY	WT.	DENSITY	WT.	DENSITY	WT.	DENSITY	WT.	DENSITY	WT.	DENSITY	WT.	DENSITY
Class 1 Moderate Traffic	A. LEVEL OR TEX. LOOP	20	3300	** 22	3450	20	3600	24	4000			33	3350	35	3450
	B. MULTILEVEL														
	C. PLUSH	24	2600									40	2850	42	2700
	D. TWIST	24	2950	24	2950					28	3250	37	3050	38	2950
	E. LEVEL CUT & LOOP	24	3200	24	3200	24	3600			32	3700	37	3300	38	3200
	F. CUT PILE HEAT SET PLIED	24	1250	24	1250					32	1500	40	2300	42	2400
	G. CUT PILE HEAT SET SINGLES			24	1250					32	2300				
Class 2 Heavy Traffic	A. LEVEL OR TEX. LOOP	26	4000	** 28	4000	26	4350	28	5000			39	4800	40	4550
	B. MULTILEVEL														
	C. PLUSH	28	4000	28	4000										
	D. TWIST	32	3500	32	3500					36	3950	48	4200	50	4000
	E. LEVEL CUT & LOOP	28	3850	28	3850	28	4000			39	4100	43	4500	45	4350
	F. CUT PILE HEAT SET PLIED	32	3600	32	3600										
	G. CUT PILE HEAT SET SINGLES														

*BCF BULK CONTINUOUS FILAMENT

** FOR BLEND PURPOSES ONLY

PART 1 GENERAL:

1.01 RELATED DOCUMENTS: Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to work of this section.

1.02 PROJECT WORK/IDENTIFICATION:

A. Work to be done consists of renovation and alteration of 2 existing buildings into apartments and commercial space; demolition of 2 existing buildings; construction of 2 new apartment buildings with commercial space; related parking and site improvements all in accordance with the Contract Documents prepared by CPF/Domenech & Hicks, Inc., Architects.

B. Summary by Reference: Work of the Contract can be summarized by reference to the Contract, General Conditions, Supplementary Conditions, Specification Sections, Drawings as listed in the "Drawing Index" bound herewith, Addenda and Modifications to the Contract Documents issued subsequent to their printing, and including but not necessarily limited to printed matter referenced by any of these.

1.03 RELATED REQUIREMENTS SPECIFIED ELSEWHERE:

A. CUTTING AND PATCHING
B. DEFINITIONS AND STANDARDS
C. SUBMITTALS
D. TEMPORARY FACILITIES
E. PROJECT CLOSEOUT

1.04 CONTRACTS: Construction work under single Lump-sum Contract.

1.05 CONTRACTOR'S DUTIES:

A. Provide and pay for all labor, materials and equipment necessary to complete the work in accordance with the Contract Documents. Include all utilities and other services required for the proper performance of the work.

B. Secure and pay for all permits, government fees and licenses required for the proper execution and completion of the work.

C. Properly coordinate the sequences of work and give required notices.

D. Comply with codes, ordinances and other legal requirements of governing authorities which affect performance of the work.

1. Submit notice to the Architect of observed variance of Contract Documents from legal requirements.

E. Notify Architect of variance of Contract Documents from job condition. Architect will make appropriate adjustment as required.

F. Enforce discipline and order among employees and hire only persons skilled in their assigned tasks.

G. Meet with Architect at intervals as requested by him, either on the project site or at other appropriate locals. Authorize responsible representation to make decisions affecting the Contract at these meetings.

1.06 CONTRACTOR'S USE OF PREMISES:

A. Confine operations at the site to areas permitted by law, ordinances, permits and Contract Documents.

B. Do not encumber the site with materials and equipment; do not load structure with weight that will damage it.

C. Assume full responsibility for protection and safekeeping of products and equipment stored on the premises. Coordinate storage of products to eliminate interference with other work operations.

D. Obtain and pay for additional storage areas if necessary.

1.07 CUTTING AND PATCHING: Include cutting and patching of both existing work and nominally completed portions of Contract work. Specific requirements and limitations for cutting and patching are specified in other sections and Division 1 General Requirements.

1.08 OWNER-FURNISHED PRODUCTS:

A. Contractor's Duties:

1. Prepare comprehensive construction schedule that designates the required delivery date for each product supplied by the Owner.
2. Inspect delivered products and report damage or defective items to Owner.
3. Handle products at site, including uncrating and storage. Protect from damage and exposure to the weather. Repair or replace any products damaged as a result of the Contractor's operations.
4. Install, connect and finish products in accordance with the Contract Documents and as recommended by the manufacturer.

END OF SECTION

PART 1 GENERAL:

1.01 RELATED DOCUMENTS: Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to work of this section. Examine referenced documents for requirements affecting the work.

1.02 ALTERNATES: An alternate is an amount proposed by Bidders and stated on Bid form that will be added to or deducted from the Base Bid amount if the Owner decides to accept a corresponding change in either scope of work or products, materials, equipment, systems or installation methods described in Contract Documents.

A. Coordination: Coordinate related work and modify or adjust adjacent work as required to ensure that work affected by each accepted alternate is complete and fully integrated into project.

B. Schedule: Specification sections referenced in the schedule contain requirements for materials and methods necessary to achieve work described under each alterante.

1. Include as part of each alternate, miscellaneous devices, appurtances and similar items incidental to or required for a complete installation whether or not mentioned as part of the alternate.

C. Schedule of Alternates:

1. Part of the Plumbing/Fire Protection bid price shall be the deduction in price of the fire pumps and related accessories (Section 15400, paragraph 2.08). Part of the Electrical system bid price shall be the deduction in price for the electrical services, associated equipment and wiring related to the installation of the fire pumps and accessories.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: Drawings and general provision of Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to work of this section.

1.02 DESCRIPTION OF REQUIREMENTS:

A. Definition: "Cutting and patching" includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition.

1. "Cutting and patching" is performed for coordination of the work, to uncover work for access or inspection, to obtain samples for testing, to permit alterations to be performed or for other similar purposes.
2. Cutting and patching performed during the manufacture of products, or during the initial fabrication, erection or installation processes is not considered to be "cutting and patching" under this definition. Drilling of holes to install fasteners and similar operations are also not considered to be "cutting and patching".
3. "Demolition and "Selective Demolition" are recognized as related-but-separate categories of work, which may or may not require cutting and patching as defined in this section; refer to "Demolition" and "Selective Demolition" sections of Division 2.

B. Refer to other sections of these specifications for specific cutting and patching requirements and limitations applicable to individual units of work.

1. Unless otherwise specified requirements of this section apply to mechanical and electrical work. Refer to Division 15 and Division 16 sections for additional requirements and limitations on cutting and patching of mechanical and electrical work.

1.03 QUALITY ASSURANCE:

A. Requirements for Structural Work: Do not cut and patch structural work in a manner that would result in a reduction of load-carring capacity or of load-deflection ratio.

B. Before cutting and patching the following categories of work, obtain the Architect's approval to proceed with cutting and patching as described in the procedural proposal for cutting patching.

1. Structural steel.
2. Miscellaneous structural metals, including lintels, equipment supports, stair systems and similar categories of work.
3. Structural concrete.
4. Foundation construction.

5. Piping, ductwork, vessels and equipment.

C. Operational and Safety Limitations: Do not cut and patch operational elements or safety related components in a manner that would result in a reduction of their capacity to perform in the manner intended, including energy performance, or that would result in increased maintenance, or decreased operational life or decreased safety.

D. Visual Requirements: Do not cut and patch work exposed on the building's exterior or in it's occupied spaces, in a manner that would, in the Architect's opinion, result in lessening the building's aesthetic qualities. Do not cut and patch work in a manner that would result in substantial visual evidence of cut and patch work. Remove and replace work judged by the Architect to be cut and patched in a visually unsatisfactory manner. Retain a recognized experienced and specialized firm to cut and patch exposed work.

1.04 SUBMITTALS:

A. Procedural Proposal for Cutting and Patching: Where prior approval of cutting and patching is required, submit proposed procedures for this work well in advance of the time work will be performed and request approval to proceed. Include the following information, as applicable, in the submittal.

1. Describe nature of the work and how it is to be performed, indicating why cutting and patching cannot be avoided. Describe anticipated results of the work in terms of changes to existing work, including structural, operational and visual changes as well as other significant elements.
2. List products to be used and firms that will perform work.
3. Give dates when work is expected to be performed.
4. List utilities that will be disturbed or otherwise be affected by work, including those that will be relocated and those that will be out-of-service temporarily. Indicate how long utility service will be disrupted.
5. Where cutting and patching of structural work involves the addition of reinforcement, submit details and engineering calculations to show how that reinforcement is integrated with original structure to satisfy requirements.
6. Approval by the Architect to proceed with cutting and patching work does not waive the Architect's right to later require complete removal and replacement of work found to be cut and patched in an unsatisfactory manner.

PART 2 - PRODUCTS

2.01 MATERIALS: Except as otherwise indicated, or as directed by the Architect, use materials for cutting and patching that are identical to existing materials. If identical materials are not available, or cannot be used, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials for cutting and patching that will result in equal-or-better performance charateristics.

PART 3 - EXECUTION

3.01 INSPECTION: Before cutting, examine the surfaces to be cut and patched and the conditions under which the work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with the work.

3.02 PREPARATION:

A. Temporary Support: To prevent failure provide temporary support of work to be cut.

B. Protection: Protect other work during cutting and patching to prevent damage. Provide protection from adverse weather conditions for that part of the project that may be exposed during cutting and patching operations.

C. Take precautions not to cut existing pipe, conduit or duct serving the building but scheduled to be relocated until provisions have been made to bypass them.

3.03 PERFORMANCE:

A. General: Employ skilled workmen to perform cutting and patching work. Except as otherwise indicated or as approved by the Architect, proceed with cutting and patching at the earliest feasible time and complete work without delay.

B. Cutting: Cut the work using methods that are least likely to damage work to be retained or adjoining work. Where possible review proposed procedures with the original installer; comply with original installer's recommendations.

1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through concrete and masonry using a cutting machine such as a carborundum saw or core drill to insure a neat hole. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces. Temporarily cover openings when not in use.
2. Comply with requirements of applicable sections of Division 2 where cutting and patching requires excavating and backfilling.

C. Patching: Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the work.

1. Where feasible, inspect and test patches to demonstrate integrity of work.
2. Restore exposed finishes of patched areas and where necessary extend finish restoration into retained adjoining work in a

manner which will eliminate evidence of patching and refinishing.

3. Where removal of walls or partitions extends one finished area into another finished area, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance.
    a. Where patch occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing patch, after patched area has received prime and base coat.

3.04 CLEANING: Thoroughly clean areas and spaces where work is performed or used as access to work. Remove completely paint, mortar, oils putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION

1.01 SUBSURFACE DATA:

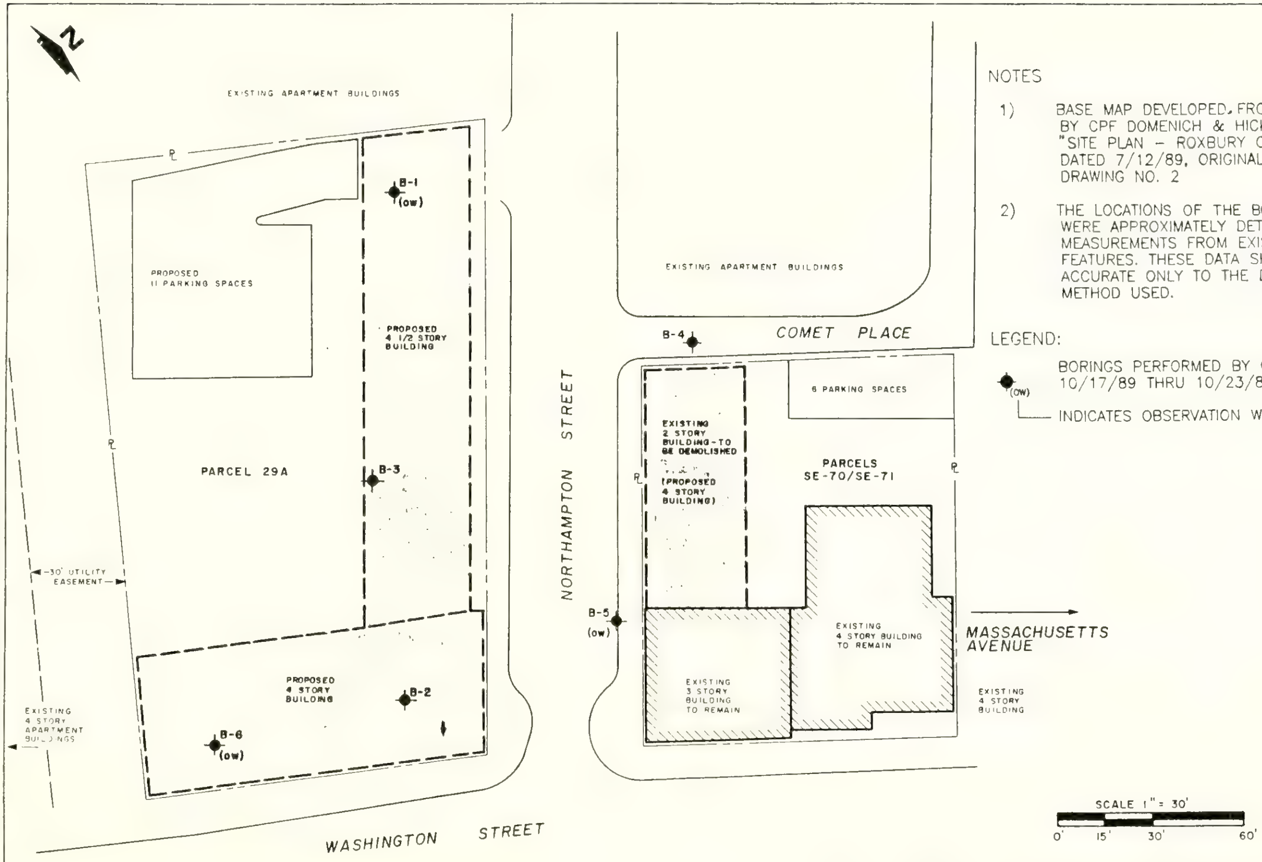
A. Subsurface soil investigations have been made and the results are attached to this Section.

B. Information attached is a record obtained in course of exploration work carried out for information of Architect. Elevations of ground water levels were determined at site at time these sub-surface explorations were carried out and may be subject to fluctuation.

C. Contractor will be responsible for conclusions he may draw from the information given; if he accepts the information he must do so at his own risk. If he prefers not to assume such risk, he must employ his own experts to analyze the information and make investigations he deems necessary. Site will be available to Contractor should he wish to conduct sub-surface explorations. Cost of such exploration is responsibility of Contractor.

D. Architect and Owner do not guarantee to continuity of conditions shown at actual locations of sub-surface explorations, or accuracy of any test boring information.

END OF SECTION


EXISTING APARTMENT BUILDINGS
PROPOSED
11 PARKING SPACES
PROPOSED
4 1/2 STORY
BUILDING
B-1
(ow)
PARCEL 29A
B-3
-30' UTILITY
EASEMENT-
PROPOSED
4 STORY
BUILDING
B-2
B-6
(ow)
EXISTING
4 STORY
APARTMENT
BUILDINGS
WASHINGTON STREET
NORTHAMPTON STREET
EXISTING APARTMENT BUILDINGS
B-4
COMET PLACE
6 PARKING SPACES
EXISTING
2 STORY
BUILDING-TO
BE DEMOLISHED
(PROPOSED
4 STORY
BUILDING)
PARCELS
SE-70/SE-71
B-5
(ow)
EXISTING
4 STORY BUILDING
TO REMAIN
EXISTING
3 STORY
BUILDING
TO REMAIN
MASSACHUSETTS
AVENUE
EXISTING
4 STORY
BUILDING
SCALE 1" = 30'
0'
15'
30'
60'
N

NOTES

1) BASE MAP DEVELOPED, FROM PLAN PROVIDED BY CPF DOMENICH & HICKS, INC. ENTITLED "SITE PLAN - ROXBURY CORNERS HOUSING", DATED 7/12/89, ORIGINAL SCALE 1" = 20' DRAWING NO. 2

2) THE LOCATIONS OF THE BORINGS WERE APPROXIMATELY DETERMINED BY TAPE MEASUREMENTS FROM EXISTING TOPOGRAPHIC FEATURES. THESE DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

LEGEND:

● BORINGS PERFORMED BY GZA DRILLING, INC. 10/17/89 THRU 10/23/89

(OW) INDICATES OBSERVATION WELL INSTALLED

PARCELS 29A/SE-70/SE-71
BOSTON, MA

EXPLORATION LOCATION PLAN

NOVEMBER 1989

FIGURE No. 2

GZA

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149119 FILE No 11680

MAKEPEACE

GZA DRILLING, INC.

1215 W. CHESTNUT ST., BROCKTON, MA 02401
(A DIVISION OF GOLDBERG-ZOINO & ASSOCIATES, INC)

PROJECT
PARCELS 29A & SE 70/71
WASHINGTON & NORTHAMPTON STS.
BOSTON, MA

REPORT OF BORING No. B-1
SHEET 1 OF 2
FILE No. 13743/11680
CHKD. BY JEH

OREMAN: P. SCHAEFER
LASSIFIED BY: J. FORDE
NSPECTOR: B. FAGAN/bsr

BORING LOCATION AS SHOWN ON PLAN
GROUND SURFACE ELEVATION ± 18' DATUM BCB
DATE START 10/18/89 DATE END 10/20/89

AMPLER: UNLESS OTHERWISE NOTED, SAMPLER CONSISTS OF A 2" SPLIT SPOON DRIVEN USING A 140 lb. HAMMER FALLING 30 In.

ASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING A 300 lb. HAMMER FALLING 24 In.

ASING SIZE: 3-3/4" HSA to 35' OTHER:

GROUNDWATER READINGS				
DATE	TIME	WATER	CASING	STABILIZATION TIME
10/18/89		14'		DURING DRILLING
10/27/89		7.5'	WELL	9 DAYS

DEPTH	CASING BLOWS	SAMPLE No.	PEN./REC	DEPTH (Ft.)	BLOWS/6"	SAMPLE DESCRIPTION	REMKS 1	STRATUM DESCRIPTION
		1	24/	0'-2'	4-6-8-9	Medium dense, dark brown, fine to medium SAND, trace Red Brick - FILL	ND	0' MISCELLANEOUS FILL
5		2	24/5	5'-7'	8-9-2-3	Medium dense, fine to coarse SAND, trace Silt, Concrete, a piece of gravel-sized Brick in the spoon - FILL	10	9'
10		3	24/24	10'-12'	11-18-30-39 Tv=(2.5 TSF)	Hard, mottled yellow gray, Silty CLAY	ND	
15		4	24/24	15'-17'	4-7-9-10 Tv=(0.89 TSF)	Very stiff, gray blue, Silty CLAY, trace Gravel	ND	HARD TO STIFF SILTY CLAY
20		5	24/24	20'-22'	3-5-4-6 Tv=(0.55 TSF)	Stiff, gray blue, Silty CLAY, trace Gravel	ND	22'
25		6	24/	25'-27'	2-3-4-2 Tv=(0.46 TSF)	Medium stiff, olive gray, Silty CLAY	ND	MEDIUM STIFF SILTY CLAY
30		7	24/24	30'-32'	3-2-4-5 Tv=(0.32 TSF)	Medium stiff, olive gray, Silty CLAY	ND	

GRANULAR SOILS Blows/Ft	Density	COHESIVE SOILS Blows/Ft	Density
0- 4	V. LOOSE	< 2	V. SOFT
4-10	LOOSE	2- 4	SOFT
10-30	M. DENSE	4- 8	M. STIFF
30-50	DENSE	8-15	STIFF
> 50	V. DENSE	15-30	V. STIFF
		> 30	HARD

REMARKS: 1. H-Nu readings represent total organic vapor levels, referenced to a benzene standard, measured in the headspace of sealed soil sample jars using an H-Nu Model PI-101 photoionization analyser. Results are reported in parts per million (ppm). ND indicates not detected. Testing completed at GZA's Newton Laboratory.

2. Tv indicates torvane soil shear strength measured in the field.

3. Obstruction encountered at 8'6", augered thru to 9'.

OTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

GZA DRILLING, INC.

1215 W. CHESTNUT ST., BROCKTON, MA 02401
A DIVISION OF GOLDBERG-ZOINO & ASSOCIATES, INC.)

PROJECT
PARCELS 29A & SE 70/71
WASHINGTON & NORTHAMPTON STS.
BOSTON, MA

REPORT OF BORING No. B-1
SHEET 2 OF 2
FILE No. 13743/11680
CHKD. BY JEH

DEPTH	CASING BLOWS	SAMPLE No.	PEN./REC.	DEPTH (Ft.)	BLOWS/6"	SAMPLE DESCRIPTION	REMKS	STRATUM DESCRIPTION
35		8	24/24	35'-37'	1-1-1-1 Tv=(0.22 TSF)	Soft, olive gray, Silty CLAY		SOFT SILTY CLAY
						Bottom of Boring at 37 feet.		
40								
45								
50								
55								
60								
65								
70								
75								

REMARKS: 4. Installed well to depth of 20' with 15' of 1½" screen and 5' of riser pipe.

GZA DRILLING, INC. 1215 W. CHESTNUT ST., BROCKTON, MA 02401 (A DIVISION OF GOLDBERG-ZOINO & ASSOCIATES, INC)	PROJECT PARCELS 29A & SE 70/71 WASHINGTON & NORTHAMPTON STS. BOSTON, MA	REPORT OF BORING No. B-2 SHEET 1 OF 2 FILE No. 13743/11680 CHKD. BY JEH

OREMAN: P. SCHAEFER
LASSIFIED BY: J. FORDE
NSPECTOR: B. FAGAN/bsr

BORING LOCATION AS SHOWN ON PLAN
GROUND SURFACE ELEVATION ± 18' DATUM BCB
DATE START 10/23/89 DATE END 10/23/89

AMPLER: UNLESS OTHERWISE NOTED, SAMPLER CONSISTS OF A 2" SPLIT SPOON DRIVEN USING A 140 lb. HAMMER FALLING 30 In.

ASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING A 300 lb. HAMMER FALLING 24 In.

ASING SIZE: 3-3/4" HSA to 35' OTHER:

GROUNDWATER READINGS

DATE	TIME	WATER	CASING	STABILIZATION TIME
10/23/89		12'		AT COMPLETION

DEPTH	CASING BLOWS	SAMPLE No.	SAMPLE PEN./REC	SAMPLE DEPTH (Ft.)	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	REMARKS 1	STRATUM DESCRIPTION
0		1	24/15	0'-2'	6-6-5-5	Medium dense, dark brown, fine to coarse SAND, some Silt, trace Gravel, Brick, Wood, Silty CLAY - FILL	2.4	0'
								MISCELLANEOUS FILL
5		2	24/6	5'-7'	1-3-1-4	Soft, gray CLAY & SILT, little (+) fine to coarse Sand, trace Brick, Wood - FILL	ND	
								9.6'
10		3	24/24	10'-12'	5-12-20-26	Hard, Yellow, Silty CLAY	32	
					Tv=(2.5 TSF)			
15		4	24/24	15'-17'	7-10-14-16	Very stiff, Yellow brown, Silty CLAY, trace fine Gravel	2.2	HARD TO STIFF SILTY CLAY
					Tv=(1.60 TSF)			
20		5	24/24	20'-22'	5-6-7-9	Stiff, Yellow, Silty CLAY	ND	
					Tv=(1.0 TSF)			
								23'
25		6	24/24	25'-27'	3-3-4-7	Medium stiff, olive gray, Silty CLAY	ND	
					Tv=(0.43 TSF)			
								MEDIUM STIFF TO VERY STIFF SILTY CLAY
30		7	24/24	30'-32'	1/18-3	Very soft to soft, Olive Gray, Silty CLAY	ND	
					Tv=(0.37 TSF)			

GRANULAR SOILS

Blows/Ft	Density
0- 4	V. LOOSE
4-10	LOOSE
10-30	M. DENSE
30-50	DENSE
> 50	V. DENSE

COHESIVE SOILS

Blows/Ft	Density
< 2	V. SOFT
2- 4	SOFT
4- 8	M. STIFF
8-15	STIFF
15-30	V. STIFF
> 30	HARD

REMARKS:
1. See Remark No. 1 on boring log B-1.
2. See Remark No. 2 on boring log B-1.

OTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

GZA DRILLING, INC.

1215 W. CHESTNUT ST., BROCKTON, MA 02401
A DIVISION OF GOLDBERG-ZOINO & ASSOCIATES, INC.)

PROJECT
PARCELS 29A & SE 70/71
WASHINGTON & NORTHAMPTON STS.
BOSTON, MA

REPORT OF BORING No. B-2
SHEET 2 OF 2
FILE No. 13743/11680
CHKD. BY JEH

DEPTH	CASING BLOWS	SAMPLE No.	SAMPLE PEN./REC.	SAMPLE DEPTH (Ft.)	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	REMKS	STRATUM DESCRIPTION
35		8	24/24	35'-37'	WOR-1-2-1 Tv=(0.35 TSF)	Soft, olive gray, Silty CLAY, little fine Sand layers	ND	SOFT SILTY CLAY
						Bottom of Boring at 37 feet.		
40								
45								
50								
55								
60								
65								
70								
75								

REMARKS:

GZA

BORING No. B-2

GZA DRILLING, INC. 1215 W. CHESTNUT ST., BROCKTON, MA 02401 (A DIVISION OF GOLDBERG-ZOINO & ASSOCIATES, INC)	PROJECT PARCELS 29A & SE 70/71 WASHINGTON & NORTHAMPTON STS. BOSTON, MA	REPORT OF BORING No. B-3 SHEET 1 OF 4 FILE No. 13743/11680 CHKD. BY JEH

FOREMAN: P. SCHAEFER
CLASSIFIED BY: J. FORDE
INSPECTOR: B. FAGAN/bsr

BORING LOCATION AS SHOWN ON PLAN
GROUND SURFACE ELEVATION ± 18' DATUM BCB
DATE START 10/17/89 DATE END 10/20/89

SAMPLER: UNLESS OTHERWISE NOTED, SAMPLER CONSISTS OF A 2" SPLIT SPOON DRIVEN USING A 140 lb. HAMMER FALLING 30 In.

CASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING A 300 lb. HAMMER FALLING 24 In.

CASING SIZE: 3-3/4" HSA to 20' OTHER: HW 20' to 30'

GROUNDWATER READINGS

DATE	TIME	WATER	CASING	STABILIZATION TIME
10/20/89		12'		DURING DRILLING

DEPTH	CASING BLOWS	SAMPLE No.	PEN./REC	DEPTH (Ft.)	BLOWS/6"	SAMPLE DESCRIPTION	REMKS 1	STRATUM DESCRIPTION
0		1	24/	0'-2'	7-13-18-22	2" TOPSOIL Dense, gray brown, fine to medium SAND, some Silt, little fine Gravel, trace Brick, Wood - FILL	0.3	0'
5								MISCELLANEOUS FILL
		2	24/17	5'-7'	4-3-6-6	Loose, brown, fine to medium SAND, some Silt, little Gravel, trace Brick, Wood, Glass - FILL	0.4	
								9'
10								
		3	24/24	10'-12'	6-13-21-22	Hard, mottled, yellow gray, Silty CLAY	0.2	
					Tv=(2.5 TSF)			
15								
		4	24/24	15'-17'	5-6-7-6	Stiff, mottled yellow gray, Silty CLAY	ND	HARD TO STIFF SILTY CLAY
					Tv=(2.5 TSF)			
20								
		5	24/24	20'-22'	4-9-7-9	Very stiff, gray blue Silty CLAY	0.1	
					Tv=(0.5 TSF)			22'
		6	24/24	23'-25'	5-4-4-5	Medium stiff, gray blue, Silty CLAY	ND	
					Tv=(0.55 TSF)			
25								
								MEDIUM STIFF SILTY CLAY
		7	24/24	28'-30'	2-3-4-4	Medium stiff, olive gray, Silty CLAY	ND	
					Tv=(0.34 TSF)			
30								

GRANULAR SOILS Blows/Ft	Density	COHESIVE SOILS Blows/Ft	Density
0- 4	V. LOOSE	< 2	V. SOFT
4-10	LOOSE	2- 4	SOFT
10-30	M. DENSE	4- 8	M. STIFF
30-50	DENSE	8-15	STIFF
> 50	V. DENSE	15-30	V. STIFF
		> 30	HARD

REMARKS:
1. See Remark No. 1 on boring log B-1.
2. See Remark No. 2 on boring log B-1.

OTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

GZA DRILLING, INC. 1215 W. CHESTNUT ST., BROCKTON, MA 02401 A DIVISION OF GOLDBERG-ZOINO & ASSOCIATES, INC.)	PROJECT PARCELS 29A & SE 70/71 WASHINGTON & NORTHAMPTON STS. BOSTON, MA	REPORT OF BORING No. B-3 SHEET 2 OF 4 FILE No. 13743/11680 CHKD. BY JEH

DEPTH	CASING	BLOWS	SAMPLE No.	PEN./REC.	DEPTH (Ft.)	BLOWS/6"	SAMPLE DESCRIPTION	REMKS	STRATUM DESCRIPTION
			8	24/24	33'-35'	2-2-2-3	Medium stiff, olive gray, Silty CLAY	ND	
						Tv=(2.6 TSF)			
35									
			9	24/24	38'-40'	WOR/18"-1	Very soft, olive gray, Silty CLAY	ND	
						Tv=(0.1 TSF)			
40									
			10	24/24	43'-45'	1-1-2-3	Soft, olive gray, Silty CLAY	ND	
						Tv=(0.6 TSF)			
45									
			11	24/24	48'-50'	2-3-3-3	Medium stiff, olive gray, Silty CLAY	ND	
						Tv=(0.4 TSF)			
50									
			12	24/24	53'-55'	3-6-8-8	Stiff, gray, Silty CLAY, some fine Sand layers	ND	MEDIUM STIFF TO VERY SOFT SILTY CLAY
						Tv=(0.4 TSF)			
55									
			13	24/24	58'-60'	1/12"-1-2	Very soft, olive gray, Silty CLAY	ND	
						Tv=(0.4 TSF)			
60									
			14	24/24	63'-65'	2-3-3-2	Medium stiff, blue gray, Silty CLAY	ND	
						Tv=(0.2 TSF)			
65									
			15	24/24	68'-70'	1/18"-3	Soft, olive gray, Silty CLAY	ND	
						Tv=(0.15 TSF)			
70									
			16	24/24	73'-75'	2-3-2-2	Medium stiff, olive gray, Silty CLAY	ND	
						Tv=(0.38 TSF)			
75									

REMARKS:

GZA DRILLING, INC.,

1215 W. CHESTNUT ST., BROCKTON, MA 02401
A DIVISION OF GOLDBERG-ZOINO & ASSOCIATES, INC.

PROJECT
PARCELS 29A & SE 70/71
WASHINGTON & NORTHAMPTON STS.
BOSTON, MA

REPORT OF BORING No. B-3
SHEET 3 OF 4
FILE No.13743/11680
CHKD. BY JEH

DEPTH	CASING	BLOWS	SAMPLE No.	SAMPLE PEN./REC.	SAMPLE DEPTH (Ft.)	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	REMKS	STRATUM DESCRIPTION
			17	24/24	78'-80'	1-1-2-3	Soft, olive gray, Silty CLAY	ND	SOFT TO VERY SOFT SILTY CLAY
80						Tv=(0.32 TSF)			
			18	24/24	83'-85'	1-1-1-1	Soft, olive gray to gray, Silty CLAY	ND	
85						Tv=(0.24 TSF)			
			19	24/24	88'-90'	WOR/18"-4	Very soft to soft, olive gray to gray, Silty CLAY	ND	
90						Tv=(0.18 TSF)			
			20	24/24	93'-95'	1/18"-1	Very loose, gray, fine SAND, some Silty CLAY (layered)	ND	
95						Tv=(0.2 TSF)			
									98'
			21	24/24	98'-100'	1/12"-1-1	Very soft to soft, gray, Silty CLAY some fine Sand	ND	OLIVE GRAY SILTY CLAY SAND LAYERS
00						Tv=(0.25 TSF)			
			22	24/24	103'-105'	1-3-4-7	Medium stiff, olive gray, Silty CLAY, little fine Sand layers (1/16"-1/8" thick)		
05						Tv=(0.15 TSF)			
									108'
			23	24/24	108'-110'	2-5-5-7	Medium dense, gray, fine SAND, little Silty CLAY layered throughout		SAND, SILTY CLAY LAYERS
10						Tv=(0.16 TSF)			
			24	24/24	113'-115'	4-8-10-13	Medium dense, gray, fine SAND, little Silty CLAY layers, nodules		
15						Tv=(0.27 TSF)			

REMARKS:

ZA

BORING No. B-3

PROJECT
PARCELS 29A & SE 70/71
WASHINGTON & NORTHAMPTON STS.
BOSTON, MA

REPORT OF BORING No. B-3
SHEET 4 OF 4
FILE No. 13743/11680
CHKD. BY JEH

DEPTH	CASING BLOWS	SAMPLE No.	PEN./REC.	DEPTH (Ft.)	BLOWS/6"	SAMPLE DESCRIPTION	REMKS	STRATUM DESCRIPTION
		25	24/24	118'-120'	4-7-15-15	Medium dense, gray, fine SAND, little (+) Clayey Silt		SAND SILTY CLAY LAYERS
					Tv=(0.28 TSF)			
120								
		26	24/2	123'-125'	6-8-8-11	Medium dense, gray, fine SAND, little Silt, trace Silty CLAY layers		
					Tv=(0.32 TSF)			
		27	24/24	128'-130'	7-7-8-12	Medium dense, gray, fine SAND, some (-) Silty CLAY layers, trace Silt		
130								
		28	24/24	133'-135'	8-9-12-14	Medium dense, gray, fine SAND, some Silt		
135						Bottom of Boring at 135 feet.		
140								

REMARKS:

GZA DRILLING, INC. 1215 W. CHESTNUT ST., BROCKTON, MA 02401 (A DIVISION OF GOLDBERG-ZOINO & ASSOCIATES, INC)	PROJECT PARCELS 29A & SE 70/71 WASHINGTON & NORTHAMPTON STS. BOSTON, MA	REPORT OF BORING No. B-4 SHEET 1 OF 2 FILE No. 13743/11680 CHKD. BY JEH

OREMAN: P. SCHAEFER
LASSIFIED BY: J. FORDE
NSPECTOR: B. FAGAN/bsr

BORING LOCATION AS SHOWN ON PLAN
GROUND SURFACE ELEVATION ± 17' DATUM BCB
DATE START 10/18/89 DATE END 10/18/89

AMPLER: UNLESS OTHERWISE NOTED, SAMPLER CONSISTS OF A 2" SPLIT SPOON DRIVEN USING A 140 lb. HAMMER FALLING 30 In.

ASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING A 300 lb. HAMMER FALLING 24 In.

ASING SIZE: 3-3/4" HSA to 20'
nd from 25' to 35' OTHER: NW from 20' to 25'

GROUNDWATER READINGS

DATE	TIME	WATER	CASING	STABILIZATION TIME
10/18/89		14'		DURING DRILLING

DEPTH	CASING	BLOWS	SAMPLE No.	PEN./REC	DEPTH (Ft.)	BLOWS/6"	SAMPLE DESCRIPTION	REMKS 1	STRATUM DESCRIPTION
0			1	24/3	0'-2'	24-38-18-11	Dense, dark brown black, fine to medium SAND, some Silt, little coal, trace fine Gravel, Glass - FILL	2.8	MISCELLANEOUS FILL
									5.5'
5			2	24/12	5'-7'	2-2-3-16	Very stiff, yellow, Silty CLAY (Possible Fill)	ND	
						Tv=(0.4 TSF)			
10			3	24/18	10'-12'	13-21-26-34	Hard, yellow, Silty CLAY (Blocky Struture)	ND	HARD TO STIFF SILTY CLAY
						Tv=(2.5 TSF)			
15			4	24/21	15'-17'	7-10-10-15	Very stiff, yellow, Silty CLAY	ND	
						Tv=(1.55 TSF)			
20			5	24/24	20'-22'	4-6-7-10	Stiff, gray blue, Silty CLAY	ND	
						Tv=(0.87 TSF)			22'
25			6	24/24	25'-27'	6-6-7-6	Stiff, olive gray, Silty CLAY	ND	MEDIUM STIFF SILTY CLAY
						Tv=(0.57 TSF)			
30			7	24/24	30'-32'	3-3-3-4	Medium stiff, olive gray, Silty CLAY	ND	
						Tv=(0.42 TSF)			

GRANULAR SOILS Blows/Ft	Density	COHESIVE SOILS Blows/Ft	Density
0- 4	V. LOOSE	< 2	V. SOFT
4-10	LOOSE	2- 4	SOFT
10-30	M. DENSE	4- 8	M. STIFF
30-50	DENSE	8-15	STIFF
> 50	V. DENSE	15-30	V. STIFF
		> 30	HARD

REMARKS:
1. See Remark No. 1 on boring log B-1.
2. See Remark No. 2 on boring log B-1.

NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

GZA DRILLING, INC.

1215 W. CHESTNUT ST., BROCKTON, MA 02401
A DIVISION OF GOLDBERG-ZOINO & ASSOCIATES, INC.)

PROJECT
PARCELS 29A & SE 70/71
WASHINGTON & NORTHAMPTON STS.
BOSTON, MA

REPORT OF BORING No. B-4
SHEET 2 OF 2
FILE No. 13743/11680
CHKD. BY JEH

DEPTH	CASING BLOWS	SAMPLE No.	 PEN./REC.	 DEPTH (Ft.)	 BLOWS/6"	SAMPLE DESCRIPTION	REMKS	STRATUM DESCRIPTION
35		8	24/24	35'-37'	1-1-2-3	Soft, olive gray, Silty CLAY	ND	SOFT SILTY CLAY
					Tv=(0.16 TSF)			
						Bottom of Boring at 37 feet.		
40								
45								
50								
55								
60								
65								
70								
75								

REMARKS:

GZA

BORING No. B-4

GZA DRILLING, INC. 1215 W. CHESTNUT ST., BROCKTON, MA 02401 (A DIVISION OF GOLDBERG-ZOINO & ASSOCIATES, INC)	PROJECT PARCELS 29A & SE 70/71 WASHINGTON & NORTHAMPTON STS. BOSTON, MA	REPORT OF BORING No. B-5 SHEET 1 OF 2 FILE No. 13743/11680 CHKD. BY JEH

FOREMAN: P. SCHAEFER
CLASSIFIED BY: J. FORDE
INSPECTOR: B. FAGAN/bsr

BORING LOCATION AS SHOWN ON PLAN
GROUND SURFACE ELEVATION DATUM BCB
DATE START 10/17/89 DATE END 10/17/89

SAMPLER: UNLESS OTHERWISE NOTED, SAMPLER CONSISTS OF A 2" SPLIT SPOON DRIVEN USING A 140 lb. HAMMER FALLING 30 In.

CASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING A 300 lb. HAMMER FALLING 24 In.

CASING SIZE: 3-3/4" HSA to 35' OTHER:

GROUNDWATER READINGS

DATE	TIME	WATER	CASING	STABILIZATION TIME
10/17/89		14'		DURING DRILLING
10/27/89		5.4'	WELL	10 DAYS

DEPTH	CASING	BLOWS	SAMPLE No.	SAMPLE PEN./REC	SAMPLE DEPTH (Ft.)	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	REMKS 1	STRATUM DESCRIPTION
0			1	24/17	0'-2'	2-4-3-3	Loose, dark brown, fine to medium SAND, some Silt, little Gravel, trace Brick FILL	2.1	MISCELLANEOUS FILL
5			2	24/10	5'-7'	1-2-6-6	Stiff, mottled, yellow gray, Silty CLAY, trace fine Gravel, fine Sand	1.2	6'
						Tv=(1.25 TSF)			
10			3	24/20	10'-12'	6-13-17-21	Hard, mottled, yellow gray, Silty CLAY	1.2	
						Tv=(2.5 TSF)			
15			4	24/24	15'-17'	3-7-9-10	Very stiff, yellow, Silty CLAY	0.3	
						Tv=(1. TSF)			HARD TO STIFF SILTY CLAY
20			5	24/13	20'-22'	3-8-9-9	Stiff, gray blue, Silty CLAY	0.4	
						Tv=(0.45 TSF)			
25			6	24/24	25'-27'	3-4-5-7	Stiff, blue gray, Silty CLAY	0.1	
						Tv=(0.5 TSF)			27'
30			7	24/24	30'-32'	2-4-4-7	Medium stiff, blue gray, Silty CLAY	ND	MEDIUM STIFF SILTY CLAY
						Tv=(0.46 TSF)			

GRANULAR SOILS

Blows/Ft	Density
0- 4	V. LOOSE
4-10	LOOSE
10-30	M. DENSE
30-50	DENSE
> 50	V. DENSE

COHESIVE SOILS

Blows/Ft	Density
< 2	V. SOFT
2- 4	SOFT
4- 8	M. STIFF
8-15	STIFF
15-30	V. STIFF
> 30	HARD

REMARKS:

1. See Remark No. 1 on boring log B-1.
2. See Remark No. 2 on boring log B-1.
3. Observation well installed to the depth of 20 feet with 1½-inch slotted PVC screen from 5 feet to 20 feet and 5 feet of 1½-inch riser pipe.

NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

GZA DRILLING, INC.

1215 W. CHESTNUT ST., BROCKTON, MA 02401
A DIVISION OF GOLDBERG-ZOINO & ASSOCIATES, INC.)

PROJECT
PARCELS 29A & SE 70/71
WASHINGTON & NORTHAMPTON STS.
BOSTON, MA

REPORT OF BORING No. B-5
SHEET 2 OF 2
FILE No. 13743/11680
CHKD. BY JEH

DEPTH	CASING	BLOWS	SAMPLE				SAMPLE DESCRIPTION	REMKS	STRATUM DESCRIPTION
			No.	PEN./ REC.	DEPTH (Ft.)	BLOWS/6"			
35			8	24/24	35'-37'	WOR-2-3-2	Medium stiff, olive gray, Silty CLAY	ND	MEDIUM STIFF SILTY CLAY
						(0.22 TSF)			
							Bottom of Boring at 37 feet.		
40									
45									
50									
55									
60									
65									
70									
75									

REMARKS:

GZA

BORING No. B-5

GZA DRILLING, INC. 1215 W. CHESTNUT ST., BROCKTON, MA 02401 (A DIVISION OF GOLDBERG-ZOINO & ASSOCIATES, INC)	PROJECT PARCELS 29A & SE 70/71 WASHINGTON & NORTHAMPTON STS. BOSTON, MA	REPORT OF BORING No. B-6 SHEET 1 OF 2 FILE No. 13743/11680 CHKD. BY JEH

FOREMAN: P. SCHAEFER
CLASSIFIED BY: J. FORDE
INSPECTOR: B. FAGAN/bsr

BORING LOCATION AS SHOWN ON PLAN
GROUND SURFACE ELEVATION ± 18.5' DATUM BCB
DATE START 10/20/89 DATE END 10/23/89

SAMPLER: UNLESS OTHERWISE NOTED, SAMPLER CONSISTS OF A 2" SPLIT SPOON DRIVEN USING A 140 lb. HAMMER FALLING 30 In.

CASING: UNLESS OTHERWISE NOTED, CASING DRIVEN USING A 300 lb. HAMMER FALLING 24 In.

CASING SIZE: 3-3/4" HSA to 15' OTHER: NW Casing 15' to 35'

GROUNDWATER READINGS

DATE	TIME	WATER	CASING	STABILIZATION TIME
10/20/89		12'		DURING DRILLING
10/27/89		7.4'	WELL	7 DAYS

DEPTH	CASING BLOWS	SAMPLE No.	SAMPLE PEN./REC	SAMPLE DEPTH (Ft.)	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	REMKS 1	STRATUM DESCRIPTION
0		1	24/11	0'-2'	5-7-8-14	Medium dense, dark brown, fine to coarse SAND, some Silt, little (+) Coal, trace Asphalt, Brick - FILL	2.8	
5		2	24/7	5'-7'	11-10-6-6	Medium dense, gray brown, fine to medium SAND, little Particle board, Conrete, Tar - FILL	ND	MISCELLANEOUS FILL
10		3A	2/17	10'-10'6	22	Dense, gray, fine to coarse SAND, little Silt, Silty CLAY, trace fine Gravel FILL	ND	10.6'
		3B		10'6-12'	14-17-15	Hard, mottled yellow gray, Silty CLAY		
					Tv=(1.95 TSF)			
15		4	24/24	15'-17'	9-12-19-17	Hard, yellow, Silty CLAY	ND	
					Tv=(1.7 TSF)			HARD TO STIFF SILTY CLAY
20		5	24/24	20'-22'	4-6-7-9	Stiff, olive gray Silty CLAY	ND	
25		6	24/24	25'-27'	6-7-6-6	Stiff, olive gray, Silty CLAY	ND	
								27'
								MEDIUM STIFF SILTY CLAY
30		7	24/24	30'-32'	3-4-3-7	Medium stiff, olive gray, Silty CLAY, little fine Sand layers	ND	

GRANULAR SOILS

Blows/Ft	Density
0- 4	V. LOOSE
4-10	LOOSE
10-30	M. DENSE
30-50	DENSE
> 50	V. DENSE

COHESIVE SOILS

Blows/Ft	Density
< 2	V. SOFT
2- 4	SOFT
4- 8	M. STIFF
8-15	STIFF
15-30	V. STIFF
> 30	HARD

REMARKS:

1. See Remark No. 1 on boring log B-1.
2. See Remark No. 2 on boring log B-1.
3. Boring originally located 3 feet south of B-6. Refusal encountered at 5 feet. Moved the hole.
4. Observation well installed to depth of 20 feet with 15 feet of 1½-inch screen and 5 feet of riser pipe.

NOTES:
1) STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARY BETWEEN SOIL TYPES, TRANSITIONS MAY BE GRADUAL.
2) WATER LEVEL READINGS HAVE BEEN MADE AT TIMES AND UNDER CONDITIONS STATED, FLUCTUATIONS OF GROUNDWATER MAY OCCUR DUE TO OTHER FACTORS THAN THOSE PRESENT AT THE TIME MEASUREMENTS WERE MADE

GZA DRILLING, INC.

1215 W. CHESTNUT ST., BROCKTON, MA 02401
A DIVISION OF GOLDBERG-ZOINO & ASSOCIATES, INC.)

PROJECT
PARCELS 29A & SE 70/71
WASHINGTON & NORTHAMPTON STS.
BOSTON, MA

REPORT OF BORING NO. B-6
SHEET 2 OF 2
FILE No. 13743/11680
CHKD. BY JEH

DEPTH	CASING	BLOWS	SAMPLE No.	SAMPLE PEN./REC.	SAMPLE DEPTH (Ft.)	SAMPLE BLOWS/6"	SAMPLE DESCRIPTION	REMKS	STRATUM DESCRIPTION
35			8	24/24	35'-37'	4-5-6-6	Medium stiff, gray, fine SAND, some Clayey Silt	ND	SAND, CLAYEY SILT
							Bottom of Boring at 37 feet.		
40									
45									
50									
55									
60									
65									
70									
75									

REMARKS:

GZA

BORING No. B-6

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to work of this section.

1.02 DEFINITIONS:

A. General Explanation: Certain terms used in the contract documents are defined generally in the article. Definitions and explanations are not necessarily complete or exclusive, but are general to the extent not stated more explicitly in other provisions of the contract documents.

B. General Requirements: The provisions of Division 1, General Requirements apply to entire work of the Contract.

C. Indicated: A cross-reference to the drawings, to other paragraphs or schedules in the specifications, and to similar means of recording requirements in the contract documents. Where terms such as "shown, "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for purpose of helping reader locate cross-reference, and no limitation of location is intended.

D. Directed, Requested, etc.: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," "accepted," and "permitted" mean "directed by Architect," "requested by Architect," etc. However, no such implied meaning will be interpreted to extend Architect's responsibility into Contractor's area of construction supervision.

E. Approve: In response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning will be held to limitations of Architect's responsibilities and duties as specified in AIA A201 General and Supplementary Conditions. In no case will "approval" by Architect be interpreted as a release of Contractor from responsibilities to fulfill requirements of contract documents.

F. Project Site: Space available to Contractor for performance of the work, either exclusively or in conjunction with others performing other work as part of the project. The extent of project site is shown on the drawings.

G. Furnish: Supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable.

H. Install: Operations at project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable.

J. Provide: Furnish and install, complete and ready for intended use, as applicable.

K. Installer: The entity engaged by the Contractor or its subcontractor or sub-subcontractor for the performance of a particular unit of work at the project site, including installation, erection, application and similar required operations. It is a general requirement that such entities be expert in operations they are engaged to perform.

L. Testing Laboratory: An independent entity engaged to perform specific inspections or tests of the work, and to report and interpret results of those inspections or tests.

1.03 FORMAT AND SPECIFICATION EXPLANATIONS:

A. Format Explanation: The format portions of these specifications can be described as follows:

1. Sections and divisions: Basic unit of specification text is a "section," each unit of which is named and numbered. These are organized into related families of "divisions"; are recognized as the industry-consensus on uniform organization of specifications. The section title is not intended to limit meaning or content of section, nor to be fully descriptive of requirements specified therein, nor to be an integral part of text.
    a. Each section of specifications has been subdivided into 3 "parts" for uniformity and convenience (Part 1 - General, Part 2 - Products, and Part 3 - Execution). These do not limit the meaning of and are not an intergal part of text which specifies requirements.

B. Subordination of Text: Portions of specification text are subordinated to other portions in the following manner (lowest level to highest):

1. Indented paragraphs and lines of text are subordinate to preceding text which is not indented, or indented by a lesser amount.
2. Paragraphs and lines of text are subordinate to subarticle titles.
3. Subarticles are subordinate to article titles.

C. Imperative Language: Used generally in specifications. Except as otherwise indicated, requirements expressed imperatively are to be performed by Contractor. For clarity at certain locations, subjective language is used to describe responsibilities which must be fulfilled indirectly by Contractor, or by others.

D. Section Numbering: Used to facilitate cross-references. Sections are placed in numeric sequence; however, numbering sequence is not complete, and listing of sections in Table of Contents must be consulted to determine numbers and names of specification sections in the Contract Documents.

E. Page Numbering: Numbered independently for each section; recorded in Table of Contents.

F. Project Indentification: Division number, Section number, Project Indentification and Page number are shown at the top of each page of specifications, to minimize confusion with other project specifications.

G. Specification Content: Certain general characteristics of content, and conventions in use of language are explained as follows:

1. Specifying Methods: Methods of specifying to record requirements varies throughout text, and may include "generic-descriptive," "compliance with standards," "performance," "proprietary," or a combination of these. Method used for specifying one unit of work has no bearing on requirements for another.
2. Overlapping and Conflicting Requirements: Where compliance with 2 or more industry standards or requirements is specified, and overlapping of those different standards or requirements established different or conflicting levels of quality, most stringent requirement (which is generally recognized to be also most costly) is intended, unless specifically detailed language written into documents (not reference to an industry standard) clearly indicated a less stringent requirement is to be fulfilled. Refer apparently-equal-but-different requirements, and uncertainties as to which level of quality is more stringent, to Architect for a decision.
    a. Contractor's Options: Except for conflicting requirements where more than one set of requirements are specified for a particular unit of work, option is intended to be Contractor's regardless of whether specifically indicated as such.

H. Minimuim Quality/Quantity: In every instance, quality level or quantity shown or specified is intended as minimum for the work to be performed or provided. Actual work may either comply exactly with that minimum (within specified tolerances), or may exceed that minimum. In complying with requirements, indicated numeric values are either minimums or maximums as noted or as appropriate for context of requirements. Refer instances of uncertainty to Architect for decision.

I. Specialists; Assignments: In certain instances, specification text requires that specific work be assigned to specialists or expert entities, who must be engaged for performance of work. These are special requirements over which Contractor has no choice or option. These assignments must not be confused with normal application of regulations, union jurisdictions and similar conventions. Nevertheless, final responsibility for fulfillment of requirements remains with Contractor.

J. Abbreviations: The language of specifications and other contract documents is of the abbreviated type in certain instances, and implies words and meanings which will be appropriately interpreted. Actual word abbreviations of a self-explanatory nature have been included in the text. Specific abbreviations have been established, for lengthy technical terminology and in conjunction with notations on drawings and in schedules. Trade association names and titles of general standards are frequently abbreviated. Singular works will be interpreted as plural and plural words will be interpreted as singular where applicable and where full context of the contract documents so indicates.

1. Upon Request a list of abbreviations referenced in documents will be supplied by Architect.

1.04 DRAWING SYMBOLS: Except as indicated, graphic symbols used on drawings are those recognized in the construction industry for purposes indicated. Where not noted, symbols are defined by "Architectural Graphic Standards," published by John Wiley & Sons, Inc.

1.05 INDUSTRY STANDARDS:

A. General Applicability of Standards: Applicable standards of construction industry have same force and effect (and are made a part of contract documents by reference) as if copied directly into contract documents.

1. Reference standards (referenced directly in contract documents or by governing regulations) have precedence over non-referenced standards which are recognized in industry for applicability to work.
2. Non-referenced standards are hereby defined to have no applicability to the work, except as a general measurement of whether work complies with standards recognized in construction industry.

B. Publication Dates: Where compliance with an industry standard is required, comply with standard in effect as of date of contract documents.

C. Copies of Standards: Provide where needed for proper performance of the work; obtain directly from publication sources.

1.06 GOVERNING REGULATIONS/AUTHORITIES: Procedure followed by the Architect has been to contact governing authorities where necessary to obtain information needed for the purpose of preparing the contract documents; recognizing that such information may or may not be of significance in relation to the Contractor's responsibilities for performing the work. Contact governing authorities directly for necessary information and decisions having a bearing on the performance of the work.

1.07 SUBMITTALS: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgements, and similar documents, correspondence and records established in conjunction with compliance with standards and regulations bearing upon performance of the work.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to work of this section.

1.02 DESCRIPTION OF REQUIREMENTS:

A. Types of submittal requirements specified in this section include shop drawings, product data, samples and miscellaneous work-related submittals. Individual submittal requirements are specified in applicable sections for each unit of work.

B. Definitions: Work-related submittals of this section are categorized for convenience as follows:

1. Shop drawings include specially-prepared technical data for this project, including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements and similar information not in standard printed form for general application to several projects.
2. Product data include standard printed information on materials, products and systems; not specially prepared for this project, other than the designation of selections from among available choices printed therein.
3. Samples include both fabricated and unfabricated physical examples of materials, products and units of work; both as complete units and as smaller portions of units of work; either for limited visual inspection or (where indicated) for more detailed testing and analysis.
4. Miscellaneous submittals related directly to the work (non-administrative) include warranties, maintenance agreements, workmanship bonds, project photographs, survey data and reports, physical work records, quality testing and certifying reports, copies of industry standards, record drawings, field measurement data, operating and maintenance materials, over-run stock and similar information, devices and materials applicable to the work and not processed as shop drawings, product data or samples.

1.03 GENERAL SUBMITTAL REQUIREMENTS:

A. Scheduling: Where appropriate in required administrative submittals (listing of products, manufacturers, suppliers and subcontractors, and in job progress schedule), show principal work-related submittals and time schedules for coordination of submittal activity with related work in each instance.

1. Listing: Prepare a separate listing, organized by related specification section number sequence, showing principal work-related submittals and their initial submittal dates as required for coordination of the work. Submit listing within 45 days of date of commencement of the work.

B. Coordination and Sequencing: Coordinate preparation and processing of submittals with performance of the work so that work will not be delayed by submittals. Coordinate and sequence different categories of submittals for same work and for interfacing units of work, so that one will not be delayed for coordination with another.

1. Provide submittals at least 15 days before date reviewed submittals will be needed.

C. Preparation of Submittals: Provide permanent marking on each submittal to identify project, applicable specification section, date, Contractor, subcontractor, submittal name and similar information to distinguish it from other submittals. Show Contractor's executed review and approval marking and provide space for Architect's "Action" marking. Package each submittal appropriately for transmittal and handling. Submittals which are received from sources other than through Contractor's offices or which do not have Contractor "approval" marking will be returned "without action."

D. Transmittal Form: AIA Form G810.

1. Contractor's responsibility for errors and omissions in submittals is not relieved by Architect's review of submittals.
2. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by Architect's review of submittals, unless Architect gives written acceptance of specific deviations.
3. Notify Architect, in writing at time of submission, of deviations in submittals from requirements of Contract Documents.

1.04 SPECIFIC-CATEGORY SUBMITTAL REQUIREMENTS:

A. General: Except as otherwise indicated in individual work sections, comply with requirements specified herein for each indicated category of submittal. Provide and process intermediate submittals, where required between initial and final, similar to initial submittals.

B. Shop Drawings: Provide newly-prepared information on reproducible sheets with graphic information at accurate scale with name of preparer indicated (firm name). Show dimensions and note which are based on field measurement. Identify materials and products in the work shown. Indicate compliance with standards and special coordination requirements. Do not allow shop drawing copies without appropriate final "Action" markings by Architect to be used in connection with the work.

1. Initial Submittal: One correctable translucent reproducible print and one blue-line or black-line reproducible will be returned.
    a. Sheet size: 8-1/2 in. X 11 in. multiples.

2. Final Submittal: 3 prints plus 2 additional prints where required for maintenance manuals; 2 will be retained and remainder will be returned, one of which is to be marked-up and maintained by Contractor as "Record Document."

C. Product Data: Collect required data into one submittal for each unit of work or system; and mark each copy to show which choices and options are applicable to project. Include manufacturer's standard printed recommendations for application and use, compliance with standards, application of labels and seals, notation of field measurements which have been checked, and special coordination requirements. Maintain one set of product data (for each submittal) at project site, available for reference by Architect and others.

1. Submittals: Do not submit product data or allow its use on the project until compliance with requirements of contract documents has been confirmed by Contractor. Submittal is for information and record, unless otherwise indicated. Initial submittal is final submittal unless returned promptly by Architect marked with an "Action", which indicates an observed non-compliance. Submit 2 copies, plus 2 additional copies (which will be returned) where required for maintenance manuals.
2. Provide a preliminary single-copy submittal where required (or desired by Contractor) for selection of options by Architect.
3. Installer's Copy: Do not proceed with installation of materials, products or systems until final copy of applicable product data is in possession of Installer.

D. Samples: Provide units identical with final condition of proposed materials or products for the work. Include "range" samples (not less than 3 units) where unavoidable variations must be expected and describe or identify variations between units of each set. Provide full set of optional samples where Architect's selection is required. Prepare samples to match Architect's sample where so indicated. Include information with each sample to show generic description, source or product name and manufacturer, limitations and compliance with standards. Samples are submitted for review and confirmation of color, pattern, texture and "kind" by Architect. Architect will not "test" samples (except as otherwise indicated) for compliance with other requirements, which are therefore the exclusive responsibility of the Contractor.

1. Submittal: At Contractor's option, provide preliminary submittal of a single set of samples for Architect's review and "Action." Otherwise, initial submittal is final submittal unless returned with an "Action" which requires resubmittal. Submit 3 sets of samples in final submittal; one set will be returned.
2. Quality Control Set: Maintain returned final set of samples at project site, in suitable condition and available for quality control comparisons by Architect and by others.

3. Reusable Samples: Returned samples which are intended or permitted to be incorporated in the work are so indicated in the individual work sections and must be in undamaged condition at time of use.

E. Mock-Ups: Where mock-ups and similar samples are indicated in individual work sections, recognized as a special type of sample, comply with requirements for "samples" to greatest extent possible and process transmittal forms to provide a record of activity.

F. Inspection and Test Reports: Classify each as either "shop drawing" or "product data," depending upon whether report is uniquely prepared for project or a standard publication of workmanship control testing at point of production, and process accordingly.

G. Warranties: Refer to work section for specific general requirements on warranties, product/workmanship bonds and maintenance agreements. In addition to copies desired for Contractor's use, furnish 2 executed copies, except furnish 2 additional copies where required for maintenance manuals.

H. Standards: Where copy submittal is indicated and, except where specified integrally with "Product Data" submittal, submit a single copy for Architect's use. Where workmanship at project site and elsewhere is governed by standard, furnish additional copies to fabricators, installers and others involved in performance of the work.

J. Closeout Submittals: Refer to "Closeout" section for specific general requirements on submittal of closeout information, materials, tools and similar items.

1. Record Document Copies: Furnish one set.
2. Maintenance/Operating Manuals: Furnish 2 bound copies.
3. Materials and Tools: Refer to individual work sections for required quantities of spare parts, extra and overrun stock, maintenance tools and devices, keys and similar physical units to be submitted.

K. General Distribution: Provide additional distribution of submittals (not included in foregoing copy submittal requirements) to subcontractors, suppliers, fabricators, installers, governing authorities and others as necessary for proper performance of the work. Include such additional copies in transmittal to Architect where required to receive "Action" marking before final distribution. Show such distributions on transmittal forms.

1.05 ACTION ON SUBMITTALS:

A. Architect's Action: Where action and return is required or requested, Architect will review each submittal, mark with "Action," and where possible return within 15 days of receipt. Where submittal must be held for coordination, Contractor will be so advised without delay.

1. No Exceptions Taken: Work may proceed, provided it complies with Contract Documents when submittal is returned.
2. Rejected: Do not proceed with work. Revise and resubmit in accordance with Contract Documents.
3. Note Markings: Work may proceed, provided it complies with notations and corrections on submittal and with Contract Documents when submittal is returned.
4. Comments Attached: Revise and resubmit in accordance with comments to obtain a different action marking.
5. Response Required of Contractor-Confirm or Resubmit: Confirm notations and corrections or resubmit to obtain different action marking.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF REQUIREMENTS:

A. Definitions: Specific administrative and procedural minimum actions are specified in this section, as extensions of provisions in General Conditions and other contract documents. These requirements have been included for special purposes as indicated. Nothing in this section is intended to limit types and amounts of temporary work required, and no omission from this section will be recognized as an indication by Architect that such temporary activity is not required for successful completion of the work and compliance with requirements of contact documents. Provisions of this section are applicable to, but not by way of limitation, utility services, construction facilities, support facilities and security/protection provisions.

B. Pay all costs for temporary facilities until completion of the work.

1.03 QUALITY ASSURANCE:

A. General: In addition to compliance with governing regulations and rules/recommendations of franchised utility companies, comply with specific requirements indicated and with applicable local industry standards for construction work.

B. ANSI Standards: Comply with applicable provisions of ANSI A10-Series standards on construction safety.

C. NFPA Code: Comply with NFPA Code 241 "Building Construction and Demolition Operations."

1.04 JOB CONDITIONS:

A. General: Establish and initiate use of each temporary facility at time first reasonably required for proper performance of the work. Terminate use and remove facilities at earliest reasonable time, when no longer needed or when permanent facilities have, with authorized use, replaced the need.

B. Conditions of Use: Install, operate, maintain and protect temporary facilities in a manner and at locations which will be safe, non-hazardous, sanitary and protective of persons and property, and free of deleterious effects.

1.05 TEMPORARY UTILITY SERVICES: Types of services required include, but not by way of limitation, water, sewerage, surface drainage, electrical power and telephone. Where possible and reasonable, connect to existing franchised utilities for required services; and comply with service companies' recommendations on materials and methods, or engage service companies to install services. Locate and relocate services (as necessary) to minimize interference with construction operations.

A. Temporary Water:

1. Furnish an adequate water supply with all necessary temporary water meters and temporary water lines and connections which may be required for the proper performance of all work under the Contract and pay for water consumed. Remove temporary water system when directed by the Architect.
2. Permits: Before the commencement of the work, obtain all necessary permits for the use of all water required for the duration of the work.
3. Installation and Maintenance: Connect temporary water mains to whatever mains are available at the site or in adjoining streets. Owner may permit the use of permanent services to the building for temporary water. If such use is permitted, turn over system to the Owner in perfect condition with any repairs required. Electrical connections for pumps shall be provided and installed by the Electrical Contractor. Provide temporary power for the pumps as required.
4. Responsibility for Damage: Be responsible for any damage caused by reason of leaky, defective or broken piping, connections or other appurtenances.

C. TEMPORARY LIGHT AND POWER

1. Provide and maintain all temporary light and power for the work, adequate for the proper performance of all work under the Contract, and pay for all current consumed.
2. Connection to Utility Company System: Make all necessary arrangements with the public utility company for the connection of temporary lighting service mains to the public utility company electrical distribution system. Pay any charges which may be made by the public utility company for extending its electrical facilities to the property line of the site of the project, and for making connections to the temporary service mains.
3. Description of Lighting System:
   a. Provide illumination at all times as required by local laws.
   b. Include all components and accessories necessary to provide sufficient illumination at all times.
4. Protective Night Lighting: Provide adequate lighting to illuminate stagings, stockpiles, projections and the like.

D. Temporary Telephones: Subscribe for telephone service at field office; to be provided for the duration of the contract. Pay for installation, removal and all billing charges.

1.06 TEMPORARY CONSTRUCTION FACILITIES: Types of temporary construction facilities required include, but not by way of limitation, enclosure of work, heat, ventilation, stairs, ladders and roads. Provide facilities reasonably required to perform construction operations properly and adequately.

A. Temporary Enclosures and Heating:

1. Provide temporary weather-tight enclosures and temporary heating as required during construction to make buildings weather-tight and protect work from freezing, and as necessary to ensure suitable working conditions for construction operations of trades. In areas of buildings where work is being conducted, maintain temperature as specified in sections of specifications but not less than 50 degrees F. Under no circumstances allow temperature to reach level which will cause damage to portions of work subject to damage by low temperatures.
2. When work has progressed sufficiently for installation of glazing, Contractor may, if approved by Architect, use glazed windows in place of temporary enclosures. Protect permanent windows against damage. On completion of work, thoroughly clean and repair damaged component parts and leave windows in perfect condition.
3. Until buildings are substantially enclosed, use smokeless portable unit heaters (U.L., Factory Mutual approved). Pay for fuel, maintenance and attendance required in connection with portable heaters.

B. Temporary Stairs, Ladders, Ramps, Hoists, and Runways: Furnish and maintain temporary stairs, ladders, ramps, hoists, runways, derricks and chutes, as required for the proper execution of work. Meet requirments of applicable laws.

C. Scaffolding: Provide all scaffolding required for the completion of work. All scaffolds shall be built in accordance with the requirements of all applicable laws and regulations. Scaffolding shall be removed upon completion or when no longer required.

1.07 TEMPORARY SUPPORT FACILITIES: Types of temporary support facilities required include, but not by way of limitation, field offices, storage sheds, fabrication sheds, sanitary facilities, drinking water, first aid facilities, bulletin board, private and public telephones, clocks, thermometer, project identification signs, clean-up facilities, waste disposal service, rodent/pest control and similar miscellaneous general services, all as may be reasonably required for proficient performance of the work and accommodation of personnel at the site including Owner's and Architect's personnel. Discontinue and remove temporary support facilities and make incidental similar use of permanent work of the project, only when and in manner authorized by Architect; and, if not otherwise indicated, immediately before time of substantial completion. Locate temporary support facilities for convenience of users and for minimum interference with construction activities.

A. Field Office: Provide space for 2 professional and one clerical persons, suitably furnished and equipped. A Construction trailer is acceptable.

B. Sanitary Facilities: Location determined by Contractor, with either piped (wet) toilet facilities or self-contained toilet units of type acceptable to governing authorities, adequate (at all stages of construction) for use of personnel at project site. Provide separate facilities for male and female personnel when both sexes are working at project site. Provide piped (wet) wash facilities with hot water; except, during time when only earthwork and foundation work are in progress, wash facilities may be limited to wet-type paper hand towels.

C. Drinking Water: Provide dispenser-type, electrical-power-cooled drinking water units; either piped with portable water or supplied with bottled water; adequate in number and locations for personnel at project site. Furnish paper cups and waste receptacles.

D. Project Identification Sign: Provide project identification sign at project site; as indicated by the Architect. Engage an experienced sign painter to paint graphics as indicated on sign. Construct sign of treated wood framing and posts, and 3/4" plywood panel of exterior type Grade B-C sanded 2 sides, size as indicated.

E. Temporary Storage: Provide at the site and maintain in good condition suitable and substantial weather-tight storage as required for materials that may be damaged by storage in open. Coordinate use by trades of available storage areas. Remove from the site upon completion of work.

1.08 RODENT AND PEST CONTROL: Early in construction process retain a recognized local exterminator or insect and pest control company to recommend practices that will minimize attraction of rodents, roaches and other pests. Employ this service to perform extermination and control procedures at regular intervals so project will be relatively free of pests and their residues at substantial completion. Perform control operations in a lawful manner using environmentally safe materials.

1.09 SECURITY/PROTECTION PROVISIONS: Types of temporary security and protection provisions required include, but not by way of limitation, fire protection, barricades, warning signs/lights, site enclosure fence, sidewalk bridges, building enclosure/lockup, watchman service, personnel security program (theft prevention), environmental protection, and similar provisions intended to minimize property losses, personal injuries and claims for damages at project site. Provide security/protection services and systems in coordination with activities and in a manner to achieve 24-hour, 7-day-per-week effectiveness.

A. Fire Extinguishers: Provide types, sizes, numbers and locations as would be reasonably effective in extinguishing fires during early stages, by personnel at project site. Provide Type A extinguishers at locations of low-potential for either electrical or grease-oil-flammable liquids fires; provide Type ABC dry chemical extinguishers at other locations; comply with recommendations of NFPA No. 10. Post warning and quick-instructions at each extinguisher location, and instruct all personnel at project site, at time of their first arrival, on proper use of extinguishers and other available facilities at project site.

B. Building Enclosure and Lockup: At beginning of work, secure building against unauthorized entrance when personnel are not working. Provide secure temporary enclosures at ground floor and other locations of possible entry, with locked entrances.

1.09 TEMPORARY PROTECTIVE COVERING:

A. Protect all finished surfaces, including the jambs and soffits of all openings used as passageways or through which materials are handled against any possible damage resulting from the conduct of work by all trades.

B. Lay tight wood sheathing under any materials that are stored on finished concrete surfaces. Lay reinforced non-staining Kraft building paper and plywood or planking over all types of finished floor surfaces in traffic areas and before moving any material over these finished areas. Use only rubber-tired wheelbarrows.

C. Do not subject roof surfaces to traffic or use for storage of material. Where activity must take place to complete the Contract, provide adequate protection, subject to approval by the Architect.

D. Keep traffic off areas where finish materials have been recently set or are curing.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 1 Specification sections, apply to work of this Section.

1.02 DESCRIPTION OF REQUIREMENTS:

A. Definitions: Closeout is hereby defined to include general requirements near end of Contract Time, in preparation for final acceptance, final payment, normal termination of contract, occupancy by Owner and similar actions evidencing completion of the work. Specific requirements for individual units of work are specified in sections of Division 2 through 16. Time of closeout is directly related to "Substantial Completion," and therefore may be either a single time period for individual parts of the work which have been certified as substantially complete at different dates. That time variation (if any) shall be applicable to other provisions of this section.

1.03 PREREQUISITES TO SUBSTANTIAL COMPLETION:

A. General: Prior to requesting Architect's inspection for certification of substantial completion (for either entire work or portions thereof), complete the following and list known exceptions in request:

1. In progress payment request, coincident with or first following date claimed, show either 100% completion for portion of work claimed as "substantially complete," or list incomplete items, value of incompletion, and reasons for being incomplete.
2. Advise Owner of pending insurance change-over requirements.
3. Submit specific warranties, workmanship/maintenance bonds, maintenance agreement, final certifications and similar documents.
4. Obtain and submit releases enabling Owner's full and unrestricted use of the work and access to services and utilities, including (where required) occupancy permits, operating certificates, and similar releases.
5. Deliver tools, spare parts, extra stocks or materials and similar physical items to Owner.
6. Make final change-over of locks and transmit keys to Owner, and advise Owner's personnel of change-over in security provisions.
7. Complete start-up testing of systems, and instructions of Owner's operating/maintenance personnel. Discontinue (or change over) and remove from project site temporary facilities and services, along with construction tools and facilities, mock-ups, and similar elements.
8. Complete final cleaning requirements, including touch-up painting of marred surfaces.
9. Touch-up and otherwise repair and restore marred exposed finishes.

B. Inspection Procedures: Upon receipt of Contractor's request, Architect will either proceed with inspection or advise Contractor of prerequisites not fulfilled. Following initial inspection, Architect will either prepare certificate of substantial completion, or advise Contractor of work which must be performed prior to issuance of certificate; and repeat inspection when requested and assured that work has been substantially completed. Results of completed inspection will form initial "punch-list" for final acceptance.

1.04 PREREQUISITES TO FINAL ACCEPTANCE:

A. General: Prior to requesting Architect's final inspection for certification of final acceptance and final payment, as required by General Conditions, complete the following and list known exceptions (if any) in request:

1. Submit final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
2. Submit updated final statement, accounting for additional (final) changes to Contract Sum.
3. Submit record drawings, record samples, miscellaneous record submittals (including warranties) and maintenance manuals.
4. Submit certified copy of Architect's final punch-list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, endorsed and dated by Architect.
5. Submit final meter readings for utilities, measured record of stored fuel, and similar data as of time of substantial completion or when Owner takes possession of and responsibility for corresponding elements of the work.
6. Submit consent of surety.
7. Revise and submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Reinspection Procedure: Upon receipt of Contractor's notice that the work has been completed, including punch-list items resulting from earlier inspections, and excepting incomplete items delayed because of acceptable circumstances, Architect will reinspect the work. Upon completion of reinspection, Architect will either prepare certificate of final acceptance or advise Contractor of work not completed or obligations not fulfilled as required for final acceptance. If necessary, procedure will be repeated.

1.05 RECORD DOCUMENT SUBMITTALS:

A. General: Specific requirements for record documents are indicated in individual sections of these specifications. Other requirements are indicated in General Conditions. General submittal requirements are indicated in "Submittals" section. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for Architect's reference during normal working hours.

B. Record Drawings: Maintain a white-print set (blue-line or black-line) of contract drawings and shop drawings in clean, undamaged condition, with mark-up of actual installations which vary substantially from the work as originally shown. Mark whichever drawing is most capable of showing "field" condition fully and accurately; however, where shop drawings are used for mark-up, record a cross-reference at corresponding location on working drawings. Mark with red erasable pencil and, where feasible, use other colors to distinguish between variations in separate categories of work. Mark-up new information which is recognized to be of importance to Owner, but was for some reason not shown on either contract drawings or shop drawings. Give particular attention to concealed work, which would be difficult to measure and record at a later date. Note related change-order numbers where applicable. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on cover of each set.

1. Submission of accurate record drawings and their approval by the Architect shall be a condition precedent to final acceptance.

C. Record Sample Submittal: Immediately prior to date of substantial completion, Architect will meet with Contractor at site, and will determine if any of submitted samples maintained by Contractor during progress of the work are to be transmitted to Owner for record purposes. Comply with Architect's instructions for packaging, identification marking and delivery to Owner's sample storage space.

D. Miscellaneous Record Submittals: Refer to other sections of these specifications for requirements of miscellaneous recordkeeping and submittals in connection with actual performance of the work. Immediately prior to date of substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to Architect for Owner's records.

E. Maintenance Manuals: Organized maintenance-and-operating manual information into suitable sets of manageable size, and bind into individual binders properly identified and indexed (thumbtabbed). Include emergency instructions, spare parts listing, copies of warranties, wiring diagrams, recommended "turn-around" cycles, inspection procedures, shop drawings, product data, and similar applicable information. Bind each manual of each set in a heavy-duty 2", 3-ring vinyl-covered binder, and include pocket folders for folded sheet information. Mark identification on both front and spine of each binder.

PART 2 PRODUCTS: Not Applicable

PART 3 EXECUTION

3.01 CLOSEOUT PROCEDURES: Arrange for each installer of work requiring continuing maintenance of operation, to meet with Owner's personnel, at project site, to provide basic instructions needed for proper operation and maintenance of entire work. Include instructions by manufacturer's representatives where installers are not expert in the required procedures. Review maintenance manuals, record documentation, tools, spare parts and materials, lubricants, fuels, identification system, control sequences, hazards, cleaning and similar procedures and facilities. For operational equipment, demonstrate start-up, shut-down, emergency operations, noise and vibration adjustments, safety, economy/efficiency adjustments, energy effectiveness, and similar operations. Review maintenance and operations in relation with applicable warranties, agreements to maintain, bonds, and similar continuing commitments.

3.02 FINAL CLEANING: Special cleaning for specific units of work is specified in sections of Divisions 2 through 16. General cleaning during progress of work is specified in General Conditions and as temporary services in "Temporary Facilities" section of this Division. Provide final cleaning of the work, at time indicated, consisting of cleaning each surface or unit of work to normal "clean" condition expected for a first-class building cleaning and maintenance program. Comply with manufacturer's instructions for cleaning operations. The following are examples, but not by way of limitation, of cleaning levels required:

A. Remove labels which are not required as permanent labels.

B. Clean transparent materials, including mirrors and window/door glass, to a polished condition, removing substances which are noticeable as vision-obscuring materials. Replace broken glass and damaged transparent materials.

C. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of dust, stains, films and similar noticeable distracting substances. Except as otherwise indicated, avoid disturbance of natural weathering of exterior surfaces. Restore reflective surfaces to original reflective condition.

D. Wipe surfaces of mechanical and electrical equipment clean, including elevator equipment and similar equipment; remove excess lubrication and other substances.

E. Remove debris and surface dust from limited-access spaces including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.

F. Clean concrete floors in non-occupied spaces broom clean.

G. Vaccum clean carpeted surfaces and similar soft surfaces.

H. Clean plumbing fixtures to a sanitary condition, free of stains including those resulting from water exposure.

J. Clean light fixtures and lamps so as to function with full efficiency.

K. Clean project site (yard and grounds), including landscape development areas, of litter and foreign substances. Sweep paved areas to a broom-clean condition; remove stains, petro-chemical spills and other foreign deposits. Rake grounds which are neither planted nor paved, to a smooth, even-textured surface.

L. Removal of Protection: Except as otherwise indicated or requested by Architect, remove temporary protection devices and facilities which were installed during course of the work to protect previously completed work during remainder of construction period.

M. Compliances: Comply with safety standards and governing regulations for cleaning operations. Do not burn waste materials at site, or bury debris or excess materials on Owner's property, or discharge volatile or other harmful or dangerous materials into drainage systems; remove waste materials from site and dispose of in a lawful manner.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements apply to the work of this Section.

1.02 DESCRIPTION OF WORK:

A. Selective demolition is defined as building demolition of limited scope, performed in such a manner as to leave adjacent construction intact and unharmed.

B. Extent of selective demolition work is indicated on the drawings.

C. Provide all demolition necessary to complete the work unless otherwise indicated.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. CUTTING AND PATCHING
B. MECHANICAL: Active lines shut-off.
C. ELECTRICAL: Live wire deactivation.

1.04 QUALITY ASSURANCE:

A. Contractor Qualifications: Minimum of 3 years experience in comparable demolition work.
B. Requirements of Regulatory Agencies: Conform to requirements of the following:

1. State Department of Public Safety.
2. State Department of Public Health.
3. Federal Occupational Safety and Health Act.
4. Environmental Protection Agency

C. Comply with applicable provisions and recommendations of ANSI A10.2 "Safety Code for Building Construction".

1.05 SUBMITTALS:

A. Permit authorizing demolition.

B. Permit for transport and disposal of debris.

C. Schedule: Indicate proposed methods and sequencing of operations. Include coordination for deactivating utility services; details for dust and noise control.

1.06 JOB CONDITIONS:

A. Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be removed.

B. Partial Demolition and Removal: Items indicated to be removed but of salvable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.

1. Storage or sale of removed items on site will not be permitted.

C. Protections: Provide temporary barricades and other protection required to protect personnel and public from injury.

   1. Provide protective measures to provide free and safe passage of personnel to and from building.
   2. Erect temporary covered passageways as required by authorities having jurisdiction.
   3. Provide interior and exterior shoring, bracing or support to prevent movement, settlement, or collapse of structure or element to be demolished, and adjacent facilities or work to remain.
   4. Protect existing finish work which is to remain from damage.
   5. Protect floors with suitable coverings when necessary.
   6. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior, and installation of new construction to insure no water leakage or damage occurs to structure or interior of existing building.
   7. Remove protections at completion of work.

E. Damages: Promptly repair damages caused to adjacent facilities by demolition work at no cost to Owner.

F. Traffic: Conduct operations in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

   1. Do not obstruct streets, walks or other facilities without permission from governing authorities. Provide alternate routes if required by authorities.

G. Explosives: Use not permitted.

H. Utility Services: Maintain existing utilities indicated to remain, keep in service and protect against damage.

J. Environmental Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air. Comply with governing regulations pertaining to environmental protection.

K. Hazardous Materials: Comply with requirements of General Conditions of the Contract.

   1. When hazardous material is observed in the work, Contractor shall cease all work related to condition and notify Owner immediately. Owner will determine course of action before work is resumed.

PART 2 PRODUCTS: Not Applicable

PART 3 EXECUTION:

3.01 INSPECTION: Prior to commencement of work, inspect areas in which work will be performed. Photograph existing conditions to structure, surfaces, equipment or surrounding properties which could be misconstrued as damage resulting from selective demolition work; file with Architect prior to starting work.

3.02 PREPARATION:

A. Provide shoring, bracing or support to prevent movement or collapse of structures to be demolished adjacent to remaining facilities.

   1. Cease operations and notify Architect immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made.

B. Cover and protect equipment and fixtures to remain when demolition work is performed in areas where such items have not been removed.

C. Locate, identify, stub off and disconnect utility services that are not indicated to remain.

3.03 DEMOLITION:

A. Perform selective demolition work in systematic manner. Use methods to complete work indicated on drawings in accordance with demolition schedule and governing regulations.

   1. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use powerdriven impact tools.
   2. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors or framing.
   3. Provide services for effective air and water pollution controls as required by governing authorities.

B. If unanticipated mechanical, electrical or structural elements which conflict with intended design are encountered, investigate and measure extent of conflict. Submit report to Architect in written detail. Pending directive from Architect rearrange schedule as necessary to continue job progress.

3.04 SALVAGE MATERIALS:

A. Salvage Items: Where indicated on drawings as "Salvage", carefully remove items, clean, store and turn over to Owner and obtain receipt.

1. Historic artifacts remain the property of Owner. Notify Architect if such items are encountered and obtain approval regarding method of removal and salvage.

3.05 DISPOSAL OF DEMOLISHED MATERIALS:

A. Remove debris, resulting from demolition operations from building site. Transport and legally dispose of materials off site.

1. If hazardous materials are encountered, comply with applicable laws and ordinances.
2. Burning of materials is not permitted on site.

3.06 CLEAN-UP AND REPAIR:

A. Upon completion of work, remove tools equipment and demolished materials from site. Remove protections and leave interior areas broom clean.

B. Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior to demolition work. Repair adjacent surfaces soiled or damaged by demolition work.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1, General Requirements, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of earthwork is indicated on drawings.

B. In general, without limitation, provide the following:

1. Layout and Grades.
2. Excavation and backfilling.
3. Trenching and backfilling for utilities.
4. Furnishing, grading and compacting all fill materials.
5. Sheeting, shoring and bracing as required.
6. Pumping and other dewatering procedures necessary to maintain excavated areas free from water.
7. Rough grading and sub-grading preparation.
8. Removal and disposal of excavated material unsuitable for fill and any other excess.

C. Excavation for Mechanical/Electrical Work: Excavation and backfill required in conjunction with underground mechanical and electrical utilities, is included as work of this section.

D. Definition: "Excavation" consists of removal of material encountered to subgrade elevations indicated and subsequent disposal of materials removed.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. WATER SERVICE
B. SEWER SYSTEM
C. MECHANICAL DIVISION: Utilities.
D. SITE PREPARATION AND DEMOLITION
E. PAVEMENT

1.04 QUALITY ASSURANCE:

A. Codes and Standards: Perform excavation work all disposal of excess material and backfill of existing basement as shown on the Construction Drawings and in compliance with applicable requirements of governing authorities having jurisdiction including but not limited to, Massachusetts Department of Environmental Protection (DEP), the City of Boston, and the Commonwealth of Massachusetts. All labor, materials, equipment, and services necesary to make the work comply with such requirements shall be provided without additional cost to the Owner.

B. Testing and Inspection Service:

1. Owner will engage soil testing and inspection service for

quality control testing during earthwork operations.

C. The Contractor shall procure and pay for all permits and licenses required for the complete work specified herin and shown on the Drawings.

1.05 JOB CONDITIONS:

A. Site Information: Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that Owner will not be responsible for interpretations or conclusions drawn therefrom by Contractor. Data are made available for convenience of Contractor. Contractor's attention should be drawin to the fact that some obstructions were encountered during drilling as noted on the boring logs.

1. Additional test borings and other exploratory operations may be made by Contractor at no cost to Owner.

B. Existing Utilities: Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations.

1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
2. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shut-off of services if lines are active.

C. Use of Explosives: NOT PERMITTED.

D. Protection of Persons and Property: Barricade open excavations occuring as part of this work and post with warning lights.

1. Operate warning lights as recommended by authorities having jurisdiction.

E. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

1. Perform excavation within drip-line of large trees to remain by hand, and protect the root system form damage or dryout to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with burlap. Paint root cuts of 1" diameter and larger with emulsified asphalt tree paint.

1.06 PROTECTION

A. Open cuts:

1. The Contractor may choose to perform a test pit prior to bidding to evaluate the feasibility of open cutting the proposed excavation. If open cut excavation is utilized, side slopes ahsll not be steeper than 1.5H:1V through fill materials.

B. Temporary Support of Excavation:

1. Furnish, put in place, and maintain earth support system as may be required to support the sides of excavations, to prevent any movement which could in any way diminsh the width of the excavation below that necessary for proper construction, and to protect adjacent structures, sidewalks and utilities from undermining or other damage. If the Engineer is of the opinion that at any points sufficient or proper supports have not been provided, he may order additional supports put in at the expense of the Contractor, and compliance with such order shall not relieve or release the Contractor from his responsibility for the sufficiency of such supports. Where lagging and bracing procedures are used, care shall be taken to prevent voids outside of the lagging, but if voids are formed, they shall be immediately filled with moist sand gravel mixed with cement in the ratio of 1 bag of cement per cubic yard of sand gravel and compacted in place. Where soil cannot be properly compacted to fill a void, lean concrete shall be used as backfill at no additional expense to the Owner.
2. The Contractor shall construct any temporary earth support system outside the neat lines of the foundation unless indicated otherwise to the extent he deems it desirable for his method of operation. Earth support walls shall be plumb and securely placed in position. Earth support walls shall be adequate to withstand all presssures which shall include but not be limited to soil, water, contruction surcharge and traffic surcharge to which the structure or trench will be subjected. Any movement or bulging which may occur shall be corrected by the Contractor at his own expense so as to provide the necessary clearances and dimensions.
3. Any temporary earth support system shall be designed in accordance with accepted engineering practice by a Professional Engineer engaged by the Contractor, registered in the Commonwealth of Massachusetts, and experienced in such design. This engineer shall define the method of construction and shall provide certification that the installation of the earth support system conforms with the design.
4. The Engineering may direct that sheeting used in any earth support system be cut off at any specified elevation. The Contractor shall leave in place to be embedded in the backfill all sheeting and bracing not shown on the Drawings but which the Engineer may direct him in writing to leave in place at any time during the progress of the work for the purpose of preventing injury to structures, utilities, or property, whether public or

private. The Contractor will be paid for such sheeting directed by the Engineer to be left in place in accordance with the unit price bid in the Proposal.

5. All earth support walls not left in place shall be carefully removed in such manner as not to endanager the construction or other structures, utilities, or property. All voids left or caused by withdrawl of earth support system shall be immediately refilled with sand by jetting or ramming with tools especially adapted to that purpose, or otherwise as may be directed.
6. The right of the Engineer to order earth support system left in place shall not be construed as creating any obligation on his part to issue such orders, and his failure to exercise his right to do so shall not relieve the Contractor from liability for damages to persons or property occuring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.
7. No sheeting is to be withdrawn if driven below mid-diameter of any pipe, and under no circumstances shall any sheeting be cut off at a level lower than 1 feet above the top of any pipe.

C. Pumping and Groundwater Control:

1. The Contractor's attention is directed to the groundwater elevations indicated on the subsurface exploration logs and measured in the observation wells. Groundwater levels will normally vary from season to season.
2. The Contractor shall construct and place all foundations structural fill, and common fill in-the-dry. In addition, the groundwater levels shall be maintained a minimim of 1 foot below the bottom of the proposed excavation to prevent development of excessive seepage gradients and potential disturbance to bearing soils. Groundwater control shall at all times be conducted in such a manner as to preserve the undisturbed condition of the subgrade soils at proposed bottom of excavation.
3. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations, and shall keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition until the fills and structures to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels. The referenced subsurface and foundation investigation reports contain suggestions for methods to perform dewatering. However, it shall be the complete responsibility of the Contractor to design and construct a groundwater control which will prevent movement and loss of the fine-grained portion of the soil, permit construction in the dry, and prevent disturbance to the subgrade soils. The Contractor shall submit to the Engineer for review the design of the dewatering systems prior to commencing work.
4. Groundwater control shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the

subgrade soils at proposed bottom of excavation. Well, well point, ejector, or sump installations shall be constructed with proper sand filters to prevent drawing of finer grained soil from the surrounding ground.

5. Water shall not enter the excavation from surface runoff. All rainfalls and seepage from the sides of the excavation, shall be removed and the bottom of excavation shall remain free from standing water.
6. The Contractor shall take all additional precautions to prevent uplift of any structure during construction.
7. Drainage and groundwater discharge shall meet the discharge criteria of Department of Environmental Protection (DEP).
8. Flotation shall be prevented by the Contractor by maintaining a positive and continuous operation of the groundwater control system. The Contractor shall be fully responsible and liable for all damages which may result from failure of this system.

1.07 SUBMITTALS:

A. Submit to the Engineer for review the proposed methods and sequence of construction, including dewatering, lateral earth support system excavation, filling, compaction, and backfilling for the various portions of the work.

B. The Contractor shall submit the following information at least four (4) weeks to the start of excavation:

1. A detailed plan and written description showing proposed sequence of demolition, backfilling of existing basements, excavation in relation to lateral support systems, constructon dewatering, and other related activities a minimum of four (4) weeks prior to start of excavation.
2. Specifics of proposed excavation and compaction equipment, including description and specifications, methods of preparation of bearing surfaces and compaction.
3. The proposed type of construction dewatering; show on a site plan the arrangement, location and depths of the proposed system components.
4. Show on a site plan proposed excavation support systems, and provide supporting design calculationgs.
5. For each type of material to be utilized as fill, the Contractor shall provide the Engineer with two (2) fifty-pound (50 lb.) bag samples from each proposed source of material.
6. The Engineer may select one, 50-lb. bag sample of each type of material for each one thousand (1,000) cubic yards placed or otherwise as deemed necessary, at time of placement.

PART 2 PRODUCTS

2.01 SOIL MATERIALS:

A. Definitions:

1. Satisfactory soil materials are defined as those complying with

ASTM D2487 soil classification groups GW, GP, GM, SM, SW and SP.

2. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH and PT.

2.02 MATERIALS:

A. Ordinary fill shall be friable soil containing no stone greater than two-thirds the loose lift thickness. The fraction finer than the No. 200 U.S. sieve shall not exceed thirty percent (30%) by weight. The material shall be essentially free of trash, ice, snow, chemical contamination, tree stumps, roots, cinders and organic materials. Material meeting Ordinary Fill specifications may be obtained from excavation provided unacceptable material is culled (organics or clay are not acceptable).

B. Granular Fill shall be free from ice and snow, roots, cinders, sod, rubbish, and other deleterious material, organic matter, or chemical contamination. Granular Fill shall conform to the following gradation requirements:

Sieve Size	Percent Finer by Weight
* 2/3 of the loose lift thickness	100
No. 10	30-95
No. 40	10-70
No. 200	0-15

* Maximum particle size for backfill of pretrench excavation along sheeting lines shall be limited to four inches (4").

C. Sand-Gravel shall consist of hard, durable sand and gravel, and shall be free from ice and snow, roots, cinders, sod, rubbish, and other deleterious material, organic matter, or chemical contamination. It shall conform to the following gradation requirements:

Sieve Size	Percent Finer by Weight
4-inch	100
1/2-inch	50-85
No. 4	40-75
No. 10	30-60
No. 40	10-35
No. 100	5-20
No. 200	2-8

D. Crushed Stone shall consist of durable crushed rock or durable crushed gravel stone, free from ice and snow, sand, clay, loam, chemical contamination, or other deleterious material. The crushed stone shall be uniformly blended and shall conform to the following requirements:

Sieve Size	Percent Finer by Weight 3/4" Stone	1-1/4" Stone
1-1/2-inch	---	100
1-1/4-inch	---	85-100
1-inch	100	---
3/4-inch	90-100	10-40
5/8-inch	---	---
1/2-inch	10-50	0-8
3/8-inch	0-20	---
No. 4	0-5	---

2.03 FURNISH AND PLACE: All fill or every kind required under this contract. Where excavated and stockpiled materials are insufficient or unsuitable for filling work, provide additional suitable material from off-site sources at no cost to the Owner.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which excavating, filling and grading are to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 EXCAVATION:

A. Excavation Classifications:

1. Earth Excavation includes excavation of pavements and other obstructions visible on ground surface; underground obstructions, structures, utilities and other items indicated to be demolished and removed; together with earth and other materials encountered that are not classified as rock or unauthorized excavation.

B. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction of Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be at Contractor's expense.

1. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Architect.
2. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by Architect.

C. Additional Excavation: When excavation has reached required subgrade elevations, notify Architect who will make an inspection of conditions.

1. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper and replace excavated material as directed by Architect.
2. Removal of unsuitable material and its replacement as directed will be paid on basis of contract conditions relative to changes in work.

D. Stability of Excavations: Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated.

1. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

E. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, selding pile and lagging uprights, stringers and cross-braces, in good serviceable condition.

1. Establish requirements for trench shoring and bracing to comply with local codes and authorities having jurisdiction.
2. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses.
    a. Provide permanent steel sheet piling or pressure creosoted timber sheet piling wherever subsequent removal of sheet piling might permit lateral movement of soil under adjacent structures. Cut off tops as required and leave permanently in place.

F. Dewatering: Prevent surface water and subsurface or ground water from flowing into excavations and from flooding project site and surrounding area.

1. Do not allow water to accumulate in excavations. Remove water to prevent softening of foundation bottoms, undercutting footings, and soil changes detrimental to stability of subgrades and foundations. Provide and maintain pumps, well points, sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.
2. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.

G. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade and shape stockpiles for proper drainage.

1. Locate and retain soil materials away from edge of excavations. Do not store within drip line of trees indicated to remain.
2. Dispose of excess soil materials and waste materials as herein specified.

H. Excavation for Structures: Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10', and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other construction, and for inspection.

1. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other work.

J. Excavation for Pavements: Cut surface under pavements to comply with cross-sections, elevations and grades as shown.

K. Excavation for Trenches: Dig trenches to the uniform width required for particular item to be installed, sufficiently wide to provide ample working room. Provide 6" to 9" clearance on both sides of pipe or conduit.

1. Excavate trenches to depth indicated or required. Carry depth of trenches for piping to establish indicated flow lines and invert elevations. Beyond building perimeter, keep bottoms of trenches sufficiently below finish grade to avoid freeze-ups.
2. For pipes or conduit 5" or less in nominal size and for flat-bottomed multiple-duct conduit units, do not excavate beyond indicated depths. Hand excavate bottom cut to accurate elevations and support pipe or conduit on undisturbed soil.
3. For pipes or conduit 6" or larger in nominal size, tanks and other mechanical/electrical work indicated to receive subbase, excavate to subbase depth indicated, or, if not otherwise indicated, to 6" below bottom of work to be supported.
4. Except as otherwise indicated, excavate for exterior water-bearing piping (water, steam, condensate, drainage) so top of piping is not less than 3'-6" below finished grade.
5. Grade bottoms of trenches as indicated, notching under pipe bells to provide solid bearing for entire body of pipe.
6. Backfill trenches with concrete where trench excavations pass within 18" of column or wall footings and which are carried below bottom of such footings, or which pass under wall footings. Place concrete to level of bottom of adjacent footings.
7. Do not backfill trenches until tests and inspections have been made and backfilling authorized by Architect. Use care in backfilling to avoid damage or displacement of pipe systems.

L. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees F. (1 degree C).

3.03 COMPACTION:

A. General: Control soil compaction during construction providing minimum percentage of density specified for each area classification indicated below.

B. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum dry density as defind by ASTM D-1557 Method C.

1. Structures, Building Slabs and Steps, Pavements: Compact top 12" of subgrade and each layer of backfill or fill material at 95% maximum dry density.
2. Lawn or Unpaved Areas: Compact top 6" of subgrade and each layer of backfill or fill material at 90% maximum dry density.
3. Walkways: Compact top 6" of subgrade and each layer of backfill or fill material at 95% maximum dry density.

C. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of subgrade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations.

D. Remove and replace, or scarify and air dry, soil material that is too wet to permit compaction to specified density.

1. Soil material that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing until moisture content is reduced to a satisfactory value.

3.04 BACKFILL AND FILL:

A. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Acceptance of construction below finish grade including, where applicable, dampproofing, and waterproofing.
2. Inspection, testing, approval, and recording locations of underground utilities.
3. Removal of concrete formwork.
4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure of utilities, or leave in place if required.
5. Removal of trash and debris.
6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.

B. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Plow, strip, or break-up sloped surfaces steeper than 1 vertical to 4 horizontal so that fill material will bond with existing surface.

1. When existing ground surface has a density less than that

specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

C. Placement and Compaction: Place backfill and fill materials in layers not more than 8" in loose depth for material compacted by heavy compaction equipment, and not more than 4" in loose depth for material compacted by hand-operated tampers.

1. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Place backfill and fill materials evenly adjacent to structures, piping or conduit to required elevations. Take care to prevent wedging action of backfill against structures or displacement of piping or conduit by carrying material uniformly around structure, piping or conduit to approximately same elevation in each lift.

3.05 GRADING:

A. General: Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are indicated, or between such points and existing grades.

B. Grading Outside Building Lines: Grade areas adjacent to building lines to drain away from structures and to prevent ponding.

C. Finish surfaces free from irregular surface changes, and as follows.

1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10' above or below required subgrade elevations.
2. Walks: Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 0.10' above or below required subgrade elevation.
3. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than 1/2" above or below required subgrade elevation.

D. Grading Surface of Fill Under Building Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of 1/2" when tested with a 10' straightedge.

E. Compaction: After grading, compact subgrade surfaces to the depth and indicated percentage of maximum or relative density for each area classification.

3.06 PAVEMENT SUBBASE COURSE:

A. General: Subbase course consists of placing subbase material, in layers of specified thickness, over subgrade surface to support a pavement base course.

B. Grade Control: During construction, maintain lines and grades including crown and cross-slope of subbase course.

C. Placing: Place subbase course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations.

1. When a compacted subbase course is shown to be 6" thick or less, place material in a single layer. When shown to be more than 6" thick, place material in equal layers, except no single layer more than 6" or less than 3" in thickness when compacted.

3.07 BUILDING BASE COURSE:

A. General: Base course consists of placement of sand-gravel material, in layers of indicated thickness, over subgrade surface to support concrete building slabs.

B. Placing: Place base course fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.

1. For building slab level located within the miscellaneous fill layer the Contractor shall excavate 1 foot of the existing fill below the proposed slab level, deep densify the existing fill subgrade with a minimum 6 to 20 passes of a 10,000 pound vibratory roller, excavate and replace soft spots with granular fill, and construct a slab-on-grade on 1 foot of sand-gravel fill.
2. For slab constructed at grade, the Contractor shall excavate 3 feet of the existing fill, proofrolling with 4 passes of a 10,000 pound vibratory roller, and constructing slab-on-grade on 3 feet of sand-gravel fill.
3. For slab level near or at clay level, the Contractor shall construct the slab-on-grade on at least 12 inches of sand-gravel fill.

3.08 FIELD QUALITY CONTROL

A. Quality Control Testing During Construction: Allow testing service to inspect and approve subgrades and fill layers before further construction work is performed.

B. If in opinion of Architect, based on testing service reports and inspection, subgrade or fills which have been placed are below specified density or disturbed, provide additional subgrade preparation, compaction and testing at no additional expense.

3.09 MAINTENANCE:

A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

1. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.

B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

C. Settling: Where settling is measurable or observable at excavated areas during general project warranty period, remove surface (pavement, lawn or other finish), add backfill material, compact, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.10 DISPOSAL OF EXCESS AND WASTE MATERIALS:

A. Remove excess excavated material, trash, debris and waste materials and dispose of it legally off Owner's property.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of paving and curbing work is shown on drawings.

B. The types of paving and curbing included are:

1. Bituminous concrete paving.
2. Portland cement concrete paving.
3. Brick Paving.
4. Precast concrete pavers.
5. New and reset granite curb.
6. Cast-in-place concrete curb.
7. Traffic and lane marking painting.
8. Rubber play surface.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. EARTHWORK: Subbase for paving.

B. SITE IMPROVEMENTS

1.04 SUBMITTALS:

A. Material Certificates: Provide copies of materials certificates signed by material producer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

B. Submit samples of brick, precase concrete pavers and rubber play surface tiles for Architect's approval.

1.05 JOB CONDITIONS:

A. Weather Limitations: Apply prime and tack coats for asphalt paving when ambient temperature is above 50 degrees F. (10 degrees C), and when temperature has not been below 35 degrees F. (1 degree C) for 12 hours immediately prior to application. Do not apply when base is wet or contains an excess of moisture.

B. Construct bituminous concrete surface course when atmospheric temperature is above 40 degrees F. and when base is dry. Base course may be placed when air temperature is above 30 degrees F. and rising.

C. Grade Control: Establish and maintain required lines and elevations.

PART 2 - PRODUCTS

2.01 BITUMINOUS CONCRETE MATERIALS:

A. General: Use locally available materials and gradations which exhibit a satisfactory record in previous installations.

B. Base Course Aggregate: Sound, angular crushed stone, crushed gravel, or crushed slag, stone or slag screenings.

1. Comply with requirements specified in EARTHWORK SECTION.

C. Surface Course Aggregate: Crushed stone, crushed gravel, crushed slag, and sharp-edged natural sand.

D. Mineral Filler: Rock or slag dust, hydraulic cement, or other inert material complying with AASHTO M 17 (ASTM D 242).

E. Asphalt Cement: Comply with AASHTO M 226 (ASTM D 3881).

1. Visocity Grade: AC-20, AR-8000.

F. Prime Coat: Cut-back asphalt type: AASHTO M 82 (ASTM D 2027) MC-30, MC-70 or MC-250.

G. Tack Coat: Emulsified asphalt, AASHTO M 140 (ASTM D 997) or M 208 (D2397), SS-1, SS-1h, CSS-1 or CSS-1h, diluted with one part water to one part emulsified asphalt.

2.02 BITUMINOUS CONCRETE MIXTURE: Class 1 bituminous concrete paving, Type 1-1 binder and top course, complying with Massachusetts Department of Highways Standard Specifications.

2.03 PORTLAND CEMENT PAVING MATERIALS FOR WALKS AND CURBS:

A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.

1. Use flexible spring steel forms or laminated boards to form radius bends as required.

2. Coat forms with a non-staining form release agent that will not discolor or deface surface of concrete.

B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A 185.

C. Concrete Materials: Comply with requirements of Section 03300 Cast-in-Place Concrete for concrete materials, admixtures, expansion joint materials and other items required.

2.04 CONCRETE MIX, DESIGN AND TESTING:

A. Comply with requirements of CAST-IN-PLACE CONCRETE SECTION for concrete mix design, sampling and testing, and quality control, and as herein specified.

B. Design mix to produce normal-weight concrete consisting of portland cement, aggregate, water-reducing admixture, air-entraining admixture and water to produce the following properties:

1. Compressive Strength: 4000 psi, minimum at 28 days.
2. Slump Range: 3"
3. Air Content: 5% to 8%.

2.05 BRICK PAVING: Solid (uncored brick) complying with ASTM C 902, Class SX, Type I, Application PS; color and texture as selected by Architect. Mortar for setting bed and joints shall conform to Commonwealth of Massachusetts Department of Public Works Standard Specification Section M4.02.15. Latex bonding agent shall be Laticrete #3701 or approved equal.

2.06 PRECAST CONCRETE PAVERS: Shall be London Walks as manufactured by Hastings Pavement Company, Freeport, NY, or approved equal, sizes, color and finish as shown on drawings. Stone dust for setting bed and joints shall be as specified under Section 02200 - EARTHWORK.

2.07 GRANITE CURB: Straight or curved as indicated with sawn top and split face, conforming to Commonwealth of Massachusetts Department of Public Works Standard Specifications, Section M9.04.1, depth and size as indicated. Mortar for joints shall confrom to Commonwealth of Massachusetts Department of Pulbic Works Standard Specifications Section M4.02.15.

A. Where indicated furnish granite curb of size, color, profile and finish to match existing granite curb.

B. Where indicated fabricate to accomodate handicapped ramps.

2.08 TRAFFIC LINE PAINT: Chlorinated rubber base paint, factory-mixed, quick drying and non-bleeding complying with FS TT-P-115, Type 111; colors as shown on drawings.

2.09 RUBBER PLAY SURFACE: Shall be Playguard safety tiles as manufactured by Carlisle Tire and Rubber Company, Carlisle, PA or approved equal. Tiles shall be 24" x 24" x 3 1/4" in thickness. Color to be selected. Adhesive and filler shall be as supplied by manufacturer.

PART 3 EXECUTION

3.01 BASE PREPARATION FOR PAVEMENTS:

A. General: Furnish all labor and materials for constructing bituminous concrete and concrete pavements, including gravel base and including repaving existing pavements torn up for installation of utilities and site improvements, as shown on the Drawings and as specified.

B. Place gravel thoroughly watered and rolled true to lines and grades with a roller weighing eight (8) to ten (10) tons. Fill any depressions that appear during or after the rolling with gravel and reroll until the surface is true and even. Compact any portion not accessible to a roller by mechanical or hand tamper.

C. Provide base course true to lines and grades as shown on the Drawings, less thickness of pavement, including cross-sections. Grade evenly and smoothly between points called for, especially transition zones, and rounding vertical curves. Construction methods shall conform to the requirements of Section 405 of Standard Specifications for Highways and Bridges, latest edition Commonwealth of Massachusetts.

3.02 PLACING BITUMINOUS CONCRETE MIX:

A. General: Place bituminous concrete mixture on prepared surface, spread and strike-off. Spread mixture at minimum temperature of 225 degrees F. (107 degrees C). Place inaccessible and small areas by hand. Place each course to required grade, cross-section, and compacted thickness.

B. Paver Placing: Place in strips not less than 10' wide, unless otherwise acceptable to Architect. After strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete base course for a section before placing surface course.

C. Joints: Make joints between old and new pavements, or between successive days work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density and smoothness as other sections of asphalt concrete course. Clean contact surfaces and apply tack coat.

3.03 ROLLING ASPHALT PAVING:

A. General: Begin rolling when mixture will bear roller weight without excessive displacement.

1. Compact mixture with hot tampers or vibrating plate compactors in areas inaccessible to rollers..

B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material.

C. Second Rolling: Follow breakdown rolling as soon as possible, while mixture is hot. Continue second rolling until mixture has been thoroughly compacted.

D. Finish Rolling: Perform finish rolling while mixture is still warm enough for removal of roller marks. Continue rolling until roller marks are eliminated and course has attained maximum density.

E. Patching: Remove and replace paving areas mixed with foreign materials and defective areas. Cut-out such areas and fill with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.

F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

G. Erect barricades to protect paving from traffic until mixture has cooled enough not to be become marked.

3.04 FORM CONSTRUCTION FOR CONCRETE PAVING:

A. Set forms to required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of work and so that forms can remain in place at least 24 hours after concrete placement.

B. Check completed formwork for grade and alignment to following tolerances:

1. Top of forms not more than 1/8" in 10'.
2. Vertical face on longitudinal axis, not more than 1/4" in 10'.

C. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.

3.05 REINFORCEMENT FOR CONCRETE PAVING:

A. Locate, place and support reinforcement as specified in CAST-IN-PLACE CONCRETE SECTION, unless otherwise indicated.

3.06 CONCRETE PLACEMENT:

A. General: Comply with requirements of CAST-IN-PLACE CONCRETE SECTION for mixing and placing concrete, and as herein specified.

B. Do not place concrete until subbase and forms have been checked for line and grade. Moisten subbase if required to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

C. Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for handspreading and consolidation. Consolidate with care to prevent dislocation or reinforcing, dowels, and joint devices.

D. Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

E. Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2-hour, place a construction joint.

F. Place concrete in 2 operations: strike-off initial pour for entire width of placement and to the required depth below finish surface. Lay fabricated bar mats immediately in final position. Place top layer of concrete, strike-off and screed.

   1. Remove and replace portions of bottom layer of concrete which has been placed more than 15 minutes without being covered by top layer or use bonding agent if acceptable to Architect.

3.07 JOINTS FOR CONCRETE PAVING:

A. General: Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.

B. Weakened-Plane (Contraction) Joints: Provide weakened-plane (contraction) joints, sectioning concrete into areas as shown on drawings. Construct weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows:

   1. Tooled Joints: Form weakened-plane joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer.

C. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for a period of more than 1/2-hour, except where such placements terminate at expansion joints.

   1. Construct joints as shown or, if not shown, use standard metal keyway-section forms.

D. Expansion Joints: Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks and other fixed objects, unless otherwise indicated.

   1. Extend joint fillers full-width and depth of joint, and not less than 1/2" or more than 1" below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface.
   2. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together.
   3. Protect top edge of joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.

3.08 CONCRETE FINISHING:

A. After striking-off and consolidating concrete, smooth surface by screeding and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

B. After floating, test surface for trueness with a 10' straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.

C. Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to 1/2" radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

D. After completion of floating and trowelling when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:

1. Broom finish, by drawing a fine-hair broom across concrete surface, perpendicular to line of traffic. Repeat operation if required to provide a fine line texture acceptable to Architect.
2. On inclined slab surfaces, provide a coarse, non-slip finish by scoring surface with a stiff-bristled broom, perpendicular to line of traffic.

E. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Architect.

3.09 CURING: Protect and cure finished concrete paving, complying with applicable requirement of CAST-IN-PLACE CONCRETE SECTION. Use membrane-forming curing and sealing compound or approved moist-curing methods.

3.10 BRICK PAVING INSTALLATION:

A. General:

1. Do not use pavers with chips, cracks, voids, discolorations or other defects which will be visibles in finished work.
2. Cut pavers with motor-driven saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly.
3. Set pavers in patterns shown and with uniform joints of width indicated.
4. Tolerances: Do not exceed 1 1/6" unit to unit offset from flush, and a tolerance of 1/8" in 2'-0" and 1/4" in 10'-0" form level or slope as indicated.

B. Brick shall be laid in full setting bed of mortar at proper level with unsanded waxed side up. Dip, brush or paint back of each pre-wetted brick with a mixture of cement and Laticrete #3701 latex or approved equal and set brick into freshly intalled mud setting bed, tamping brick level and true. Leveling of brick should be done as setting operation proceeds so that it is not necessary to disturb bricks set earlier. Grouting should not be done until settin bed sets and hardens (minimum 24 hours). Laticrete #3701 shall be mixed with water in a 1:1 ratio.

C. Joints shall be solidly filled to full depth with mortar. Joints shall be a nominal 5/16" to 3/8" wide. Care shall be taken not to smear mortar on adjoining brick, concrete or other surface.

D. After initial set of mortar, joints shall be finished by tooling with a 1" diameter non-staining jointer (preferably, a hard maple jointer), to produce a very slight concave polished joint free from drying cracks. After installation joints shall be cured for at least 5 days by covering with curing paper or other approved material. As soon as joints have cured wax shall be removed with high pressure steam. Care shall be taken not to damage mortar by overheating any area.

E. Contractor shall be responsible for closing off traffic to avoid damage to paving until mortar has set.

3.11 PRECAST CONCRETE PAVERS: Place precast concrete pavers on stone dust setting bed placed and compacted as specified under Section 02200 - EARTHWORK. Set pavers in patterns as shown on the drawings. Allow space for joints as shown. Fill joints with stone dust and compact.

3.12 NEW AND RESET GRANITE CURBING:

A. Excavate trench 18 inches wide and 6 inches deeper than bottom of curb.

B. Spread crushed stone on subgrade and compact to finish depth of 6 inches.

C. Spread additional gravel as required and set curb. Fill spaces under curb with gravel, so curb will be completely supported. Set curb at line and grade indicated. Fit curbs no closer than 1/8 inch.

D. Fill joints with cement mortar and neatly point top and front exposed portions. Clean off excess mortar.

E. Fill space between curb and wall of trench with gravel thoroughly tamped, to the depth indicated. Maintain grade of curb.

3.13 TRAFFIC AND LANE MARKINGS:

A. Cleaning: Sweep and clean surface to eliminate loose material and dust.

B. Apply paint with mechanical equipment to produce uniform straight edges. Apply in 2 coats at manufacturer's recommended rates.

3.14 RUBBER PLAY SURFACE:

A. Install rubber tiles on concrete base as shown on the drawings and as per manufacturer's recommendations. Apply using 100% adhered system as described in manufactuer's literature. Concrete base must cure for a minimum of 28 days prior to installation.

B. Cut out for play structure posts, curbs, walls and edges as required and as described in manufacturer's literature. Backfill all edges, cut outs, and other gaps in tile surface completely with edger/filler compound as supplied by manufacturer.

3.15 FIELD QUALITY CONTROL FOR ASPHALT PAVING:

A. General: Test in-Place asphalt concrete courses for compliance with requirements for thickness and surface smoothness. Repair or remove and replace unacceptable paving as directed by Architect.

B. Thickness: In-place compacted thickness will not be acceptable if exceeding following allowable variation from required thickness:

1. Base Course: 1/2", plus or minus.
2. Surface Course: 1/4", plus or minus.

C. Surface Smoothness:

1. Base Course Surface: 1/4" for walks and roads.
2. Wearing Course Surface: 3/16" for walks and roads..

D. Check surface areas at intervals as directed by Architect.

3.16 REPAIRS AND PROTECTIONS:

A. Repair or replace broken or defective paving and curbing, as directed by Architect.

B. Drill test cores where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect paving and curbing from damage until acceptance of work. Exclude traffic for at least 14 days placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1, General Requirements, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of sewer system work is shown on drawings.

B. Sewer system work includes, but is not limited to:

1. Sanitary sewer conduits.
2. Storm sewer conduits.
3. Manholes, frames and covers.
4. Catch basins, drop inlets frames and gratings.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. EARTHWORK: Excavation and Backfilling.

B. WATER SERVICE

C. CAST-IN-PLACE CONCRETE

D. PLUMBING: Buildings waste systems.

1.04 QUALITY ASSURANCE:

A. Installer: Firm specializing and experienced in sewer collection system work for not less than 3 years.

B. Code Compliance: Comply with City of Boston Plumbing Code; Boston Water and Sewer Commission Standard Specifications; other authorities having jurisdiction.

C. Structural Compliance: System components to withstand H20 loading requirements.

1.05 SUBMITTALS:

A. Product data and installation instructions for each product specified.

B. Shop drawings for system, showing conduit types and sizes, locations, elevations and slopes for horizontal runs. Include details of underground structures, accessories, fittings, and connections.

C. Record Drawings: At completion of work submit record drawings of installed sewage system and components in accordance with Division I General Requirements.

PART 2 PRODUCTS

2.01 CONDUIT MATERIALS:

A. General: Furnish ells, tees, reducing tees, wyes, couplings, increasers, crosses, transitions and end caps of same type and class of material as conduit, or of material having equal or superior physical and chemical properties as acceptable to the Architect.

B. Polyvinyl-chloride Pipe:

1. ASTM D 3034 (SDR 35) for gravity sewer pipe.
   a. Fittings: Elastomeric joints per ASTM D 3212; seals per ASTM F 477.
2. ASTM D 241 (SDR 26) for pressure sewer pipe.
   a. Fittings: Elastomeric joints per ASTM D 3212; seals per ASTM F 477.
3. ASTM F 794 for large diameter ribbed sewer pipe.
   a. Fittings: Elastomeric joints per ASTM D 3212; seals per ASTM D 2855.

C. Reinforced Concrete Pipe: Shall conform to Boston Water Sewer Commission Standard Specifications.

D. Polyethylene Pipe: Shall be perforated and non-perforated polyethylene tubing as manufactured by ADS Inc., Columbus, OH., or approved equal. Sizes as shown on the drawings. Perforated polyethylene tubing shall be provided with filter fabric sleeve as provided by pipe manufactuer. Provide all necessary coupiers, sittings, and caps, etc. as indicated and/or required..

2.02 CONCRETE MANHOLES AND DRYWELLS:

A. Concrete Base: Use concrete which will attain 28-day compressive strength of not less than 3000 psi. Meet criteria specified in CAST-IN-PLACE CONCRETE SECTION.

B. Precast Concrete Manholes Catch Basin and Drop Inlets: Shall conform to Boston Water and Sewer Commission Standard Specifications.

C. Precast Concrete Drywells and Holding Tanks: ANSI/ASTM C 478, sized and shaped as indicated.

D. Area Dains: Shall be high impact plastic components as supplied by National Diversified Sales, Inc., Newbury Park, CA. Color shall be black. Provide all components, grates, sittings, couplings, occ. as shown on the Drawings and/or as requried.

2.03 MASONRY MATERIALS:

A. Manhole Brick: ANSI/ASTM C 32, Grade MS.

B. Sewer Brick: ANSI/ASTM C 32, Grade SS.

C. Masonry Mortar: ANSI/ASTM C 270, Type M.

2.04 ACCESSORIES:

A. Manhole Frames and Covers: Grey cast iron , ANSI/ASTM A 48, Class 30 B heavy-duty.

1. Furnish covers with 30" diameter clear opening: cast in legend "SEWER" in 3" letters; with non-penetrating pick holes.
2. Sandblast covers and apply 2 coats coal-tar pitch varnish.

B. Catch Basin and Drop Inlet Frames and Gratings: Grey cast iron, ANSI/ASTM A 48, Class 30B heavy-duty.

C. Bituminous Dampproofing: Semi-fibrated type mastic non-asbestos type mastic non-asbestos compound; FS SS-A-694, excepting no asbestos fibers.

D. Bedding Stone: Evenly graded mixture of crushed stone 1" to 3/8" diameter.

PART 3 EXECUTION:

3.01 INSPECTION: Examine the areas and conditions under which the work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 INSTALLATION OF CONDUIT:

A. General:

1. Install conduit in accordance with City of Boston requirements.
2. Inspect conduit before installation to detect apparent defects. Mark defective materials with white paint and promptly remove from site.
3. Lay conduit beginning at low point of system, true to grades and alignment indicated with unbroken continuity of invert.
4. Place bell ends or groove end of concrete conduit facing upstream.
5. Install gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements.
6. Concrete Pipe: Install in accordance with applicable provisions of American Concrete Pipe Association "Concrete Pipe Installation Manual".
   a. Place circular concrete pipe with elliptical reinforcing so that reference lines indicating top of pipe are not more than 5 degrees from vertical plane through longitudinal axis of pipe.
7. Plastic Pipe: Install in accordance with manufacturer's recommendations and in accordance with ASTM D 2321.
8. Cleaning Conduit: Clear interior of conduit of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed.

9. Place plugs in ends of uncompleted conduit at end of day or whenever work stops.
10. Flush lines between manholes if required to remove collected debris.

B. Joint Adaptors: Make joints between cast iron pipe and other types of pipe with standard manufactured cast iron adapters and fittings.

C. Closing Abandoned Utilities: Close open ends of abandoned underground utilities which are indicated to remain in place. Provide sufficiently strong closures to withstand hydro-static or earth pressure which may result after ends of abandoned utilites have been closed.

1. Close open ends of concrete of masonry utilities with not less than 8" thick brick masonry bulkheads.
2. Close open ends of conduit with threaded metal caps or plastic plugs, or other acceptable methods suitable for size and type material being closed. Wood plugs are not acceptable.

D. Interior Inspection: Inspect conduit to determine whether line displacement or other damage has occurred.

1. Make inspections after lines between manholes, or manhole locations, have been installed and approximately two feet of back fill is in place and at completion of project.
2. If inspection indicates poor alignment, debris, displaced pipe, infiltration or other defects, correct such defects to satisfaction of Architect.

3.03 UNDERGROUND STRUCTURES:

A. Masonry Construction Manholes:

1. Use sewer brick to construct masonry manholes.
2. Mix mortar with only enough water for workability. Retempering of mortar will not be permitted. Keep mortar mixing and conveying equipment clean. Do not deposit mortar upon, or permit contact with, the ground.
3. Lay masonry in mortar to form full bed with ends and side joints in one operation, and full bed and vertical joints, not more than 5/8" wide. Protect fresh masonry from freezing and too rapid drying.
4. Apply a 1/2" thick mortar coating on both interior and exterior wall surfaces.
5. Where manholes occur in pavements, set tops of frames and covers flush with finish surface. Elsewhere, set tops 3" above finish surface, unless otherwise indicated.

B. Precast Concrete Manholes: Place precast concrete sections as shown on drawings. Where manholes occur in pavements, set tops of frames and covers flush with finish surface. d Elsewhere, set tops 3" above finish surface, unless otherwise indicated.

1. Seal joints as required by City of Boston.
2. Apply 2 coats bituminous mastic to exterior surfaces.

C. Catch Basins: Construct catch basins to the sizes and shapes indicated.

1. Use concrete which will attain a 28-day compressive strength of not less than 3000 psi. Meet criteria specified in CAST-IN-PLACE CONCRETE SECTION.
2. Set cast iron frames and gratings to elevations indicated.

D. Precast Drywalls and Tanks: Place precast concrete drywalls and tanks as shown on drawings. Set tops of drywells frames and covers flush with finish surface.

E. Area Drains: Install in accordance with manufacturer's recommendations and as shown on the Drawings.

3.04 TAP CONNECTIONS:

A. Make connections to existing conduits and underground structures, so that finished work will conform as nearly as practicable to requirements for new work.

B. Branch connections made from side into existing 12"-to-21" conduit shall have a wye sprung into the existing line, and entire wye encased with not less than 6" of 3000 psi 28-day compressive strength concrete.

C. For branch connections from side into existing 24" or larger conduit or to underground structures, cut opening into unit sufficiently large to allow 3" of concrete to be packed around entering connection. Cut ends of connection passing through conduit or structure wall to conform to shape of and be flush with inside wall, unless otherwise indicated. ON outside of conduit or structure wall, encase entering connection in 6" of concrete for a minimum length of 12" to provide additional support or collar from connection to undisturbed ground.

1. Provide concrete which will attain a minimum 28-day compressive strength of 3000 psi. Meet criteria specified in CAST-IN-PLACE CONCRETE SECTION.
2. Use an epoxy bonding compound as interface between new and existing concrete and conduit materials.

D. Take care while making tap connections to prevent concrete or debris from entering existing conduit or structure. Remove debris, concrete, or other extraneous material which may accumulate.

3.05 BACKFILLING: Conduct backfill operations of open-cut trenches closely following laying, jointing and bedding of pipe, and after initial inspection and testing are completed. Refer to EARTHWORK SECTION.

3.06 TESTING: Perform testing of completed conduit lines and underground structures in accordance with City of Boston requirements.

3.07 Cleaning: Clean up during installation and upon completion of work. Remove excess materials, debris and equipment from site. Repair damage resulting from work.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of site improvements is shown on the drawings.

B. Types of site improvements work included are:

1. Concrete retaining walls.
2. Timber edge.
2. Play structure.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. EARTHWORK: Rough grading.
B. PAVING AND CURBING.
C. CAST-IN-PLACE CONCRETE.

1.04 QUALITY ASSURANCE:

A. Comply with local governing regulations where more stringent than specified.

1.05 SUBMITTALS:

A. Product Data: Submit manufacturer;s technical data and installation instructions for each product specified. Include certifications that each product complies with specified requirements.

B. Shop Drawings: Submit shop drawings for fabricated items specified. Include plans, elevations, details and method of anchorage.

1.06 JOB CONDITIONS:

A. Protect property adjacent to the work from injury.

B. Protect existing trees, utility structures, pavements and other existing work to remain.

C. Hand excavate around existing trees and items to remain. Cover exposed tree roots immediately with new loam.

D. Install protective devices along pavement edges to prevent undermining during earthwork operations.

PART 2 PRODUCTS

2.01 CONCRETE RETAINING WALLS: Use 3500 psi air-entrained concrete in compliance with requirements of CAST-IN-PLACE CONCRETE SECTION.

A. Weep holes shall be made from PVC pipe inserted in form work. Provide filtar fabric on inside face of wall. See drawings for sizes.

2.02 TIMBER EDGE: Lumber for timber edges shall be kiln dried pressure treated southern yellow pine, sizes as shown on the drawings. Pins shall be reinforcing steel, sizes and lengths as shown on the drawings.

2.03 PLAY STRUCTURES: Shall be Playbooster Model 8944 manufactured by Landscape structures, Delano, MN, modified as shown on the drawings. Structures shall be supplied with aluminum posts and Tenderdecks. Colors to be selected by Architect. Concrete for footings shall be as specified under CAST-IN-PLACE CONCRETE Section elsewhere.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which site improvement work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 INSTALLATION:

A. Concrete Retaining Walls: construct as indicated in compliance with CAST-IN-PLACE CONCRETE SECTION.

B. Timber Edge: Construct timber edges to lines and grades shown on drawings. Stagger ends of stacked timbers 3'-0" min. Pin timbers with at least 2 pins per timber where required. Drive tops of pins min. 1/2" below top of timbers.

C. Play Structures: Construct and install play structure as per manufacturer's instructions. Concrete for footings shall be min. 300 psi, placed in conformance with CAST-IN-PLACE CONCRETE SECTION. Touch up all painted surfaces as required after assembly is complete.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of landscape development work is shown on drawings and in schedules.

B. Types of work included are:

1. Topsoil and finish grading.
2. Tilling.
3. Fertilizing.
4. Sodding.
5. Planting.
6. Maintenance.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. EARTHWORK: Rough grading.

1.04 QUALITY ASSURANCE:

A. Subcontract landscape work to a single firm specializing in landscape work.

B. Source Quality Control:

1. General: Ship landscape materials with certificates of inspection required by governing authorities. Comply with regulations applicable to landscape materials.
2. Do not make substitutions. If specified landscape material is not obtainable, submit proof of non-availability to Architect, together with proposal for use of equivalent material.
3. Analysis and Standards: Package standard products with manufacturer's certified analysis. For other materials, provide analysis by recognized laboratory made in accordance with methods established by the Association of Official Agriculture Chemists, wherever applicable.
4. Trees and Shrubs: Provide shrubs of quantity, size, genus, species and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1 "American Standard for Nursery Stock". Provide healthy, vigorous stock, grown in recognized nursery in accordance with good horticultural practice and free of disease, insects, eggs, larvae and defects such as knots, sun-scald, injuries, abrasions, or disfigurement.
5. Label at least one tree and one shrub of each variety with a securely attached waterproof tag bearing legible designation of botanical and common name.

a. Where formal arrangement or consecutive order of trees or shrubs are shown, select stock for uniform height and spread, and label with number to assure symmetry in planting.

C. Inspection: The Architect may inspect trees and shrubs either at place of growth or at site before planting, for compliance with requirements for genus, species, variety, size and quality. Architect retains right to further inspect shrubs for size and condition of balls and root systems, insects, injuries and latent defects, and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected shrubs immediately from project site.

1.05 SUBMITTALS:

A. Certification: Submit certificates of inspection as required by governmental authorities. Submit manufacturer's or vendors certified analysis for soil amendments and fertilizer materials. Submit other data substantiating that materials comply with specified requirements.

1. Submit seed vendor's certified statement for each grass seed mixture required, stating botanical and common name, percentage by weight, and percentages of purity, germination, and week seed for each grass seed species.

B. Planting Schedule: Submit proposed planting schedule, indicating dates for each type of landscape work during normal seasons for such work in area of site. Correlate with specified maintenance periods to provide maintenance from date of substantial completion. Once accepted, revise dates only as approved in writing, after documentation of reasons for delays.

C. Maintenance Instructions: Submit typewritten instructions recommending procedures to be established by Owner for maintenance of landscape work for one full year. Submit prior to expiration of required maintenance period(s).

1.06 DELIVERY, STORAGE AND HANDLING:

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis and name of manufacturer. Protect materials from deterioration during delivery, and while stored at site.

B. Shrubs: Provide freshly dug shrubs. Do not prune prior to delivery unless otherwise approved by Architect. Do not bend or bind-tie shrubs in such manner as to damage bark, break branches or destroy natural shape. Provide protective covering during delivery. Do not drop balled and burlapped stock during delivery.

C. Deliver shrubs after preparations for planting have been completed and plant immediately. If planting is delayed more than 6 hours after delivery, set shrubs in shade, protect from weather and mechanical damage, and keep roots moist by covering with mulch, burlap or other acceptable means of retaining moisture.

D. Do not remove container grown stock from containers until planting time.

1.07 JOB CONDITIONS:

A. Proceed with the complete landscape work as rapidly as portions of site become available, work with seasonal limitations for each kind of landscape work required.

B. Utilities: Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

C. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Architect before planting.

D. Planting Time: Plant or install materials during normal planting seasons for each type of landscape work required. Correlate planting with specified maintenance periods to provide maintenance from date of substantial completion.

E. Coordination with Lawns: Plant shrubs after final grades are established and prior to planting of lawns, unless otherwise acceptable to Architect. If planting of shrubs occurs after lawn work, protect lawn areas and promptly repair damage to lawns resulting from planting operations.

1.08 SPECIAL PROJECT WARRANTY:

A. Warranty lawns through specified lawn maintenance period, and until final acceptance.

B. Warranty shrubs, for a period of one year after date of substantial completion, against defects including death and unsatisfactory growth, except for defects resulting from neglect by Owner, abuse or damage by others, or unusual phenomena or incidents which are beyond Landscape Installer's control.

C. Remove and replace shrubs, or other plants found to be dead or in unhealthy condition during warranty period. Make replacement during growth season following end of warranty period. Replace shrubs which are in doubtful condition at end of warranty period; unless, in opinion of Architect, it is advisable to extend warranty period for a full growing season.

PART 2 - PRODUCTS

2.01 TOPSOIL:

A. Provide new topsoil which is fertile, friable, natural loam, surface soil, reasonably free of subsoil, clay lumps, brush, weeds and other litter, and free of roots, stumps, stones larger than 1" in any dimension, and other extraneous or toxic matter harmful to plant growth.

   1. Obtain topsoil from local sources or from areas having similar soil characteristics to that found at project site. Obtain topsoil only from naturally, well-drained sites where topsoil occurs in a depth of not less than 4"; do not obtain from bogs or marshes. Topsoil shall contain 70%-75% sand.

2.02 SOIL AMENDMENTS:

A. Lime: Natural limestone containing not less than 85% of total carbonates, ground so that not less than 90% passes a 10-mesh sieve and not less than 50% passes a 100-mesh sieve.

B. Aluminum Sulfate: Commercial grade.

C. Peat Humus: FS Q-P-166 and with texture and ph range suitable for intended use.

D. Superphosphate: Soluble mixture of treated minerals, 20% available phosphoric acid.

E. Manure: Well rotted, unleached stable or cattle manure containing not more than 25% by volume by straw, sawdust or other bedding materials and containing no chemicals or ingredients harmful to plants.

F. Mulch: Organic mulch free from deleterious materials and suitable for top dressing of trees, shrubs or plants and consisting of one of the following:

   1. Ground or shredded bark.
   2. Pine needles.

G. Commercial Fertilizer: Complete fertilizer of neutral character, with some elements derived from organic sources and containing following percentages of available plant nutrients:

   1. For trees and shrubs, provide fertilizer with not less than 5% total nitrogen 10% available phosphoric acid and 5% soluble potash.
   2. For lawns, provide fertilizer with percentage of nitrogen required to provide not less than 1 lb. of actual nitrogen per 100 sq.ft. of lawn area and not less than 4% phosphoric acid and 2% potassium. Provide nitrogen in a form that will be available to lawn during initial period of growth; at least 50% of

nitrogen to be organic form.

2.03 PLANT MATERIALS:

A. Quality: Provide trees, shrubs, and other plants of size, genus, species and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1 "American Standard for Nursery Stock".

B. Deciduous Trees and Shrubs: Provide shrubs of the height shown or listed and with not less than minimum number of canes required by ANSI Z60.1 for type and height of shrub required.

1. Provide balled and burlapped (B&B) deciduous trees and shrubs.
2. Container grown deciduous shrubs will be acceptable in lieu of balled and burlapped deciduous shrubs subject to specified limitations for container grown stock.

C. Coniferous and Broadleafed Evergreens: Provide evergreens of sizes shown or listed. Dimensions indicate minimum spread for spreading and semi-spreading type evergreens and height for other types, such as globe, dwarf, cone, pyramidal, broad up-right, and columnar. Provide normal quality evergreens with well-balanced form complying with requirements for other size relationships to the primary dimension shown.

1. Provide balled and burlapped (B&B) evergreens.
2. Container grown evergreens will be acceptable subject to specified limitations for container grown stock.

2.04 SOD MATERIALS:

A. Grade 1 Sod shall be a mixture of Kentucky Bluegrass varieties, with a minimum of 10% Red Fescue or Chewing's Fescue, or equal approved by the Architect. Sod shall be well rooted turf free from disease, insect pests, weeds and any other harmful matter.

B. Sod shall be machine cut at a uniform soild thickness of 3/4 inch, plus or minus 1/4 inch, at the time of cutting. Measurement for thickness shall exclude top growth and thatch. Individual pieces of sod shall be cut to the supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be 5%. Broken pads and torn or uneven ends will not be acceptable. Sod shall be at least one year old from time of original seeding.

C. Standard size sections of sod shall be strong enough to support their own weight and retain their size and shape when suspended vertically from a firm grasp on the upper 10% of the section.

D. Sod shall be harvested, delivered and installed within a period of 36 hours. Sod not transplanted within this period shall be inspected and approved by the Architect prior to its installation. Soil on sod pads shall be kept moist at all times.

2.05 MISCELLANEOUS LANDSCAPE MATERIALS:

A. Anti-Erosion Mulch: Provide clean, seed-free salt hay or threshed straw of wheat, rye, oats or barley.

B. Anti-Dessicant: Emulsion type, film-forming agent designed to permit transpiration but retard excessive loss of moisture from plants. Deliver in manufacturer's fully identified containers and mix in accordance with manufacturer's instructions.

PART 3 - EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which landscape work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 PREPARATION:

A. Preparation of Planting:

1. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful or toxic to plant growth.
2. Mix specified soil amendments and fertilizers with topsoil at rates specified. Delay mixing of fertilizer if planting will not follow placing of planting soil within a few days.
   a. "Schedule of Planting Soil Mixture Requirements" is attached at end of this section.
3. For pit and trench type backfill, mix planting soil prior to backfilling, and stockpile at site.
4. For planting beds and lawns, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.
   a. Mix lime with dry soil prior to mixing of fertilizer.
   b. Prevent lime from contacting roots of acid-loving plants.

B. Preparation for Planting Lawns:

1. Loosen subgrade of lawn areas to a minimum depth of 4". Remove stones over 1-1/2" in any dimension and sticks, roots, rubbish and other extraneous matter. Limit preparation to areas which will be planted promptly after preparation.
   a. Spread top soil mixture to minimum compacted depth of six (6) inches to meet lines, grades and elevations shown, after light rolling and natural settlement. Add specified soil amendments and mix thoroughly into upper 4" of topsoil.

C. Preparation of Unchanged Grades: Where lawns are to be planted in areas that have not been altered or disturbed by excavating, grading, or stripping operations, prepare soil for lawn planting as follows: Till to a depth of not less than 6"; apply soil amendments and initial fertilizers as specified; remove high areas and fill in depressions; till soil to a homogenous mixture of fine texture, free of lumps, clods, stones, roots and other extraneous matter.

1. Prior to preparation of unchanged areas, remove existing grass, vegetation and turf. Dispose of such material outside of Owner's property; do not turn over into soil being prepared for lawns.
2. Apply specified commerical fertilizer at rates specified and thoroughly mix into upper 2" of topsoil. Delay application of fertilizer if lawn planting will not follow within a few days.
    a. "Schedule of Planting Soil Mixture Requirements", indicating required rate of fertilizer application, is attached at end of this section.

D. Fine grade lawn areas to smooth, even surface with loose, uniformly fine texture. Roll, rake and drag lawn areas, remove ridges and fill depressions, as required to meet finish grades. Limit fine grading to areas which can be planted immediately after grading.

E. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface moisture to dry before planting lawns. Do not create a muddy soil condition.

F. Restore lawn areas to specified condition if eroded or otherwise disturbed after fine grading and prior to planting.

G. Excavation for Trees and Shrubs:

1. Excavate pits, beds and trenches with vertical sides and with bottom of excavation slightly raised at center to provide proper drainage. Loosen hard subsoil in bottom of excavation.
2. For balled and burlapped (B&B) trees and shrubs, make excavations at least half again as wide as the ball diameter and equal to the ball depth, plus following allowance for setting of ball on a layer of compacted backfill:
    a. Allow for 3" setting layer of planting soil mixture.
3. For container grown stock, excavate as specified for balled and burlapped stock, adjusted to size of container width and depth.

H. Dispose of subsoil removed from planting excavations. Do not mix with planting soil or use as backfill.

I. Fill excavations for shrubs with water and allow to percolate out before planting.

3.03 PLANTING:

A. Planting Trees and Shrubs:

1. Set balled and burlapped (B&B) stock on layer of compacted planting soil mixture, plumb and in center of pit or trench with top of ball at same elevation as adjacent finished landscape grades. Remove burlap from side of balls; retain on bottoms. When set, place additional backfill around base and sides of ball, and work each layer to settle backfill and eliminate voids and air pockets. When excavation is approximately 2/3-full, water thoroughly before placing remainder of backfill. Repeat

watering until no more is absorbed. Water again after placing final layer of backfill.

2. Set container grown stock as specified for balled and burlapped stock, except cut cans on 2 side with an approved can cutter; remove bottoms of wooden boxes after partial backfilling so as not to damage root balls.
3. Dish top of backfill to allow for mulching.
4. Mulch pits, trenches and planted areas. Provide not less than following thickness of mulch and work into top of backfill and finish level with adjacent finish grades.
    a. Provide 3" thickness of mulch.
5. Apply anti-dessicant using power spray to provide an adequate film over trunks, branches, stems, twigs and foliage.
    a. If deciduous trees and shrubs are moved in full-leaf, spray with anti-dessicant at nursery before moving and again 2 week after planting.
6. Prune, thin out and shape shrubs in accordance with standard horticultural practice. Prune shrubs to retain natural character.
7. Remove and replace excessively pruned or misformed stock resulting from improper pruning.

3.04 SODDING:

A. Sodding of lawns shall be done only by experienced workmen under the supervision of a qualified forman. Sodding shall consist of soil preparation, sodding, rolling, pegging, weeding, fertilizing, watering and otherwise providing all labor and materials necessary to secure the establishment of acceptable turf.

B. The soil on which the sod is laid shall be reasonably moist and shall be watered, if directed by the Architect. The sod shall be laid smoothly, edge to edge, and where continuous or solid sodding is called for on the plans sod shall be laid with the longest dimension parallel to the contours. Sodding shall start at the base of slopes and progress upward in continous parallel rows. Vertical joints between sods shall be staggered. Immediately after laying, sod shall be pressed firmly into contact with the sod bed by tamping, rolling, or by other approved methods so as to eliminate all air pockets, provide true and even surfaces, insure knitting and protect all exposed sod edges, but without displacement of the sod or deformation of the sod surface. The sodded areas shall be watered evely and at a rate of five gallons per square yard, unless otherwise directed by the Architect.

C. In all swales, on all slopes one on two or steeper and elsewhere where specified or as directed by the Architect, sods shall be held in place by stakes. Pegging shall be done immediately after tamping. At least one stake shall be driven through each sod to be pegged and the stakes shall be not more than two feet apart. Stakes shall have their flat sides against the slope and be driven flush.

3.05 MAINTENANCE:

A. Begin maintenance immediately after planting.

B. Maintain trees and shrubs until final acceptance but in no case less than following periods:

  1. 30 days after substantial completion of planting.

C. Maintain trees and shrubs by pruning, cultivating and weeding as required for healthy growth. Restore planting saucers. Reset shrubs to proper grades or vertical position as required. Spray as required to keep shrubs free of insects and disease.

D. Maintain lawns for not less than the period stated below, and longer as required to establish an acceptable lawn.

  1. Sodded lawns, not less than 60 days after substantial completion.
    a. If sodded in fall and not given full 60 days of maintenance, or if not considered acceptable at that time, continue maintenance the following spring until acceptable lawn is established.

E. Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading and replanting as required to establish a smooth, acceptable lawn, free of eroded or bare areas.

3.06 CLEANUP AND PROTECTION:

A. During landscape work, keep pavements clean and work area in an orderly condition.

B. Protect landscape work and materials from damage due to landscape operations, operations by other contractors and trades and trespassers. Maintain protection during installation and maintenance periods. Treat, repair or replace damaged landscape work as directed.

3.07 INSPECTION AND ACCEPTANCE:

A. When landscape work is completed, including maintenance, Architect will, upon request, make an inspection to determine acceptability.

B. Where inspected landscape work does not comply with requirements, replace rejected work and continue specified maintenance until reinspected by Architect and found to be acceptable. Remove rejected plants and materials promptly from project site.

3.08 SCHEDULE OF PAINTING SOIL MIXTURE REQUIREMENTS:

A. For backfill for trees and shrubs, provide specified materials in not less than the following quantities:

1. 1 part of loose peat humus to 5 parts of topsoil by volume.
2. 20 lbs. of commercial 10-5-10 fertilizer per cu.ft.of backfill.

B. For lawn areas, provide not less than the following quantities of specified materials:

1. 1 part of loose peat humus to 3 parts of topsoil by volume.
2. 20 lbs. of lime per 1000 sq.ft.
3. 20 lbs. of commercial 5-10-5 fertilizer per 1000 sq.ft.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division-1 General Requirements apply to the work of this Section.

1.02 DESCRIPTION OF WORK:

A. Extent of concrete work is shown on the drawings.

B. Furnish labor, materials, accessories, and equipment necessary to complete concrete work including formwork, reinforcement, concrete mixing, placing, finishing and curing as indicated; in general, include the following:

1. Walls and footings.
2. Slabs.
3. Vapor barrier under slabs on grade.
4. Stairs and ramps.
5. Fill
6. Grouting.

C. Provide labor and equipment necessary to install items which require embedment in concrete as furnished by other Sections.

D. Repair of existing defective concrete surfaces is included as work of this section.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. PAVING AND CURBING
B. JOINT SEALANTS: Joint sealants.

1.04 QUALITY ASSURANCE:

A. Codes and Standards: Comply with the provisions of the following codes, specifications and standards, except where more stringent requirements are shown or specified:

1. ACI 301 "Specifications for Structural Concrete for Buildings".
2. ACI 311 "Recommended Practice for Concrete Inspection".
3. ACI 318 "Building Code Requirements for Reinforced Concrete".
4. ACI 347 "Recommended Practice for Concrete Formwork".
5. ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete".
6. Concrete Reinforcing Steel Institute, "Manual of Standard Practice".

B. Workmanship: The Contractor is responsible for correction of concrete work which does not conform to the specified requirements, including strength, tolerances and finishes. Correct deficient concrete as directed by the Architect.

C. Concrete Testing Service: The Contractor will employ a testing laboratory acceptable to Architect to perform material evaluation tests and to design concrete mixes.

1. Materials and installed work may require testing and retesting, as directed by the Architect, at any time during the progress of the work. Allow free access to material stockpiles and facilities at all times. Tests, not specifically indicated to be done at the Owner's expense, including the retesting of rejected materials and installed work, shall be done at the Contractor's expense.
2. Certificates of material properties and compliance with specified requirements may be submitted in lieu of testing, when acceptable to the Architect. Certificate of compliance must be signed by the materials producer and the Contractor.

1.05 SUBMITTALS:

A. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including reinforcement and forming accessories, admixtures, and others as requested by the Architect.

B. Shop Drawings:

1. Concrete Reinforcement: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with the ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, arrangement of concrete reinforcement. Include special reinforcement required at openings through concrete structures.
2. Formwork: Submit shop drawings for fabrication and erection of specific finished concrete surfaces as indicated. Show general construction of forms including jointing, special form joint or reveals, location and pattern of form tie placement, and other items which affect exposed concrete visually.
   a. Architect's review is for general architectural applications and features only. Design of formwork for structural stability and efficiency is Contractor's responsibility.

C. Laboratory Test Reports: Submit 2 copies of labratory test reports for concrete materials and mix design test as specified.

D. Materials Certificates: Provide materials certificates in lieu of materials laboratory test reports only when permitted by the Architect. Material certificates shall be signed by the manufacturer and the Contractor, certifying that each material item complies with, or exceeds, the specified requirements.

PART 2 PRODUCTS

2.01 FORM MATERIALS:

A. Forms for Exposed Finish Concrete: Construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.

1. Use overlaid plywood complying with U.S. Product Standard PS-1 "B-B High Density Overlaid Concrete Form", Class I.

B. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concreat surfaces.

2.02 REINFORCING MATERIALS:

A. Reinforcing Bars: ANSI/ASTM 615, Grade 60, Deformed.

B. Welded Wire Fabric: ANSI/ASTM A 185, welded steel wire fabric.

C. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI recommendations.

1. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

2.03 CONCRETE MATERIALS:

A. Portland Cement: ANSI/ASTM C 150, Type I or II.

1. Use one brand of cement throughout the project, unless otherwise acceptable to Architect.

B. Normal Weight Aggregates: ANSI/ASTM C 33, and as herein specified. Provide aggregates from a single source for exposed concrete.

1. Local aggregates not complying with ANSI/ASTM C 33 but which have shown by special test or actual service to produce concrete of adequate strength and durability may be used when acceptable to the Architect.
2. Maximum Aggregate Size: 1/2 inch for floor slabs; 3/8 inch elsewhere. Use 1-1/2 inch aggregate in footings only.

C. Water: Clean, fresh, drinkable.

D. Air-Entraining Admixture: ANSI/ASTM C 260.

E. Water-Reducing Admixture: ANSI/ASTM C 494, Type A, and contain not more than 1% chloride ions.

F. Calcium chloride will not be permitted.

2.04 RELATED MATERIALS:

A. Preformed Expansion Joint Fillers: Resilient and non-extruding type premolded bituminous impregnated fiberboard units complying with ASTM D 1751, FS HH-F-341, Type I and AASHTO M 213.

B. Joint Sealing Compound: See Joint Sealants Section.

C. Moisture Barrier: Provide moisture barrier cover over prepared base material where shown on drawings. Use only materials which are resilient to decay when tested in accordance with ASTM E 154, as follows:

1. Polyethelene sheet not less than 6 mils thick.

D. Waterstops: Provide flat, dumbbell type or centerbulb type waterstops at construction joints and other joints as shown. Size to suit joints.

1. Rubber waterstops: Corps of Engineers CRD-C 513.

E. Non-Shrink Grout: CRD-C 588, factory pre-mixed grout.

F. Chemical Hardener: Colorless aqueous solution containing a blend of magnesium fluosilicate and zinc fluosilicate combined with a wetting agent, containing not less than 2 lbs. of fluosilicate per gallon.

G. Non-slip Aggregate Finish: Provide fused aluminum oxide grits, or crushed emery, as abrasive aggregate for non-slip finish with emery aggregate containing not less than 40% aluminum ozide and not less than 25% ferric oxide. Use material that is factory-graded, packaged, rust-proof and non-glazing, and is unaffected by freezing, moisture and cleaning materials.

H. Moisture-Retaining Cover: One of the following, complying with ASTM C 171:

1. Waterproof paper.
2. Polyethylene film.
3. Polyethylene-coated burlap.

I. Bonding Compound: Polyvinyl acetate, rewettable type.

2.05 PROPORTIONING AND DESIGN OF MIXES:

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method is used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing unless otherwise acceptable to Architect.

1. Submit written reports to the Architect of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until mixes have been reviewed by the Architect.

B. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:

1. 3000 psi concrete 28-day compressive strength; 480 lbs. cement per cu. yd.; minimum W/C ratio, 0.58 maximum.
2. 3500 psi 28-day compressive strength; 560 lbs. cement per cu. yd. minimum; W/C ratio, 0.51 maximum.
3. 4000 psi 28-day compressive strength; 560 lbs. cement per cu. yd. minimum; W/C ratio, 0.44 maximum.

C. Adjustment to Concrete Mixes: Mix design adjustments may be requested by the Contractor when characteristics of materials, job condition, weather, test results, or other circumstances warrant; at no additional cost to the Owner and as accepted by the Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by the Architect before using in the work.

D. Admixtures: Use air-entraining admixture in exterior exposed concrete. Add air-entraining admixture at the manufacturer's prescribed rate to result in concrete at the point of placement having air content within the following limits:

1. Concrete structures and slabs exposed to freezing and thawing or subjected to hydraulic pressure:
   a. 4% for maximum 2 inch aggregate.
   b. 6% for maximum 3/4 inch aggregate.
2. Use admixtures for water-reducing in strict compliance with the manufacturer's directions.

E. Slump Limits: Proportion and design mixes to result in concrete slump at the point of placement as follows:

1. Ramps and sloping surfaces: Not more than 3".
2. Reinforced foundation systems: Not less than 1" and not more than 3".
3. Other concrete: Not less than 1" and not more than 4".

2.06 CONCRETE MIXING:

A. Ready-Mix Concrete: Comply with the requirements of ANSI/ASTM C 94, and as herein specified.

1. Delete the references for allowing additional water to be added to the batch for material with insufficient slump. Addition of water to the batch will not be permitted.
2. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.
    a. When air temperature is between 85 degrees F and 90 degrees F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes.
3. Submit mixing procedure to be used in cold weather to the Architect for approval.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which the work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 FORMS:

A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by the concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.

1. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.

B. Construct forms complying with ACI 347, to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, leveland plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected material to obtain finishes. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.

C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and for easy removal.

D. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

E. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.

F. Form Ties: Factory-fabricated, adjustable-length, stainless steel snapoff metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

1. Provide ties so portion remaining within concrete after removal is at least 1-1/2" inside concrete.
2. Provide form ties which will not leave holes larger than 1" diameter in concrete surface.

G. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.

H. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt and other debris just before concrete is placed. Retighten forms and bracing after concrete placement if required to eliminate mortar leaks and maintain proper alignment.

3.03 PLACING REINFORCEMENT:

A. Comply with the specified codes and standards, and Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.

D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.04 JOINTS:

A. Construction Joints: Locate and install construction joints, which are not shown on the drawings, so as not to impair the strength and appearance of the structure, as acceptable to the Architect.

B. Provide keyways at least 1-1/2 inches deep in construction joints in walls, slabs and between walls and footings.

C. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.

D. Isolation Joints in Slabs-on-Ground: Construct isolation joints in slabs on ground at points of contact between slabs on ground and vertical surfaces, such as column pedestals, foundation walls, grade beams and elsewhere as indicated.

E. Control Joint in Slabs-in-Ground: Construct control joints in slabs-in-ground to form panels of patterns as shown. Use inserts 1/4 inch x 1/5 to 1/4 of the slab depth, unless otherwise indicated.

1. Form joints by inserting premolded hardboard or fiberboard strip into fresh concrete until top surface of strip is flush with slab surface. After concrete has cured, remove inserts and clean groove of loose debris.

3.05 INSTALLATIONS OF EMBEDDED ITEMS:

A. General: Set and build into the work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of the items to be attached thereto.

B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.

3.06 PREPARATION OF FORM SURFACES:

A. Coat the contact surfaces of forms with a form-coating compound before reinforcement is placed.

B. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating compound manufacturer's directions. Do not allow excess form-coating material to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

3.07 CONCRETE PLACEMENT:

A. Preplacement Inspection: Before placing concrete, inspect and complete the formwork installation, reinforcing steel, and items to be embedded or cast-in. Notify other crafts to permit the installation of their work; cooperate with other trades in setting such work. Wet wood forms immediately before placing concrete where form coatings are not used.

1. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

B. General: Comply with ACI 304, and as herein specified.

1. Deposit concrete continously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation.

C. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

D. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.

E. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6" into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segragation of mix.

F. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within the limits of construction joints, until the placing of a panel or section is completed.

1. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Bring slab surfaces to the correct level with a straightedge and strikeoff. Smooth the surface, leaving it free of humps or hollows. Do not disturb the slab surfaces prior to beginning finishing operations.

G. Maintain reinforcing in proper position during concrete placement operations.

H. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
2. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators.

J. Hot Weather Placing: When hot weather conditions exist that would seriously impair the quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.

1. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
2. Wet forms thoroughly before placing concrete.
3. Use water-reducing retarding admixture when required by high-temperatures, low humidity, or other adverse placing conditions.

3.08 FINISH OF FORMED SURFACES:

A. Roughen Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction. This is the concrete surface having the texture imparted by the form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.

B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, such as waterproofing, dampproofing, painting or other similar system. This is the as-cast concrete surface obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely romoved and smoothed.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise shown.

3.09 MONOLITHIC SLAB FINISHES:

A. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo, and as otherwise indicated.

1. After screening, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance not exceeding 1/4" in 10' when tested with a 10' straightedge. Cut down high spots and fillow spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

B. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, paint or other thinfilm finish coating system.

1. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8" in 10' when tested with a 10' straightedge. Grind smooth surface defects which would telegraph through applied floor covering system.

C. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.

1. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

D. Chemical-Hardener Finish: Apply chemical-hardener finish to interior concrete floors not to receive other finishes. Apply liquid chemical-hardener after complete curing and drying of the concrete surface.

1. Apply proprietary chemical hardeners, in accordance with manufacturer's printed instructions.

E. Non-Slip Aggregate Finish Apply non-slip aggregate finish to concrete stair treads, platforms, ramps, and elsewhere as indicated.

1. After completion of float finishing, and before starting trowel finish, uniformly spread 25 lbs. of dampened non-slip aggregate

per 100 sq. ft. of surface. Tamp aggregate flush with surface using a steel trowel, but do not force below surface. After broadcasting and tamping, apply trowel finishing as herein specified.

a. After curing, lightly work surface with a steel wire brush, or an abrasive stone, and water to expose non-slip aggregate.

3.10 CONCRETE CURING AND PROTECTION:

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures, and maintain without drying at a relatively constant temperature for a period of time necessary for hydrating of cement and proper hardening.

1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishings. Weather permitting, keep continuously moist for not less than 72 hours.
2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.

B. Curing Methods: Perform curing of concrete by moist curing or moisture-retaining cover curing, and by combinations thereof, as herein specified.

1. Provide moisture curing by following methods:
   a. Keep concrete surface continuously wet by covering with water.
   b. Continuous water-fog spray.
   c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4" lap over adjacent absorptive covers.
2. Provide moisture-cover curing as follows:
   a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

C. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

3.11 REMOVAL OF FORMS:

A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

B. Formwork supporting weight of concrete, such as beam soffits, slabs and other structural elements, may not be removed in less than 14 days and until concrete has attained design minimum compressive strength of 28-days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

3.12 RE-USE OF FORMS:

A. Clean and repair surfaces of forms to be re-used in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

3.13 MISCELLANEOUS CONCRETE ITEMS: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with inplace construction. Provide other miscellaneous concrete filling shown or required to complete work.

A. Grouting: Provide for lintels, bond beams and elsewhere as indicated on drawings. Maintain accurate location of reinforcing steel during placement.

3.14 CONCRETE SURFACE REPAIRS:

A. Patching Defective Areas: Repair and patch defective areas with cement mortar as directed by Architect.

B. Cut out honeycomb, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Before placing cement mortar or proprietary patching compound, thoroughly clean, dampen with water and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.

1. For exposed-to-view surfaces, blend white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

C. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; stains and other discolorations that connot be removed by cleaning. Flush out form tile holes, fill with dry pack mortar, or precast cement cone plugs secured in place with bonding cement.

D. Repair concealed formed surfaces where possible, that contain defects that affect the durability of concrete. If defects connot be repaired, remove and replace concrete.

E. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope, in addition to smoothness, using a template having required slope.

F. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01" wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.

G. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.

H. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary patching compounds may be used when acceptable to the Architect.

J. Repair defective areas, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

K. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean surface of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry-pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

L. Repair methods not specified above may be used, subject to acceptance of Architect.

3.15 QUALITY CONTROL TESTING DURING CONSTRUCTION:

A. The Owner will employ a testing laboratory to perform site tests and submit test reports.

B. Sampling and testing for quality control during the placement of concrete may include the following, as directed by the Architect:

1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
2. Slump: ASTM C 143; one test for each concrete load at point of discharge; and one test for each set of compressive strength test specimens.
3. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure for normal weight concrete; one for each set of compressive strength test specimens.
4. Concrete Temperature: Test hourly when air temperature is 40 degrees F and below, and when 80 degrees F and above; and each time a set of compression test specimens is made.
5. Compression Test Specimen: ASTM C 31; one set of 6 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
6. Compressive Strength Tests: ASTM C 39; one set for each 100 cu. yds. or fraction thereof, of each concrete class placed in any one day or for each 5,000 sq. ft. of surface area placed; 2 specimens tested at 7 days, 3 specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

C. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 are used.

D. When total quantity for a given class of concrete is less than 50 cu. yds. strength test may be waived by Architect if, in his judgement, adequate evidence of satisfactory strength is provided.

E. When strength of field-cured cylinders is less than 85% of companion laboratory-cures cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

F. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.

G. Test results will be reported in writing to the Architect and the Contractor on the same day that tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in the structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day tests and 28-day tests.

H. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of architectural precast concrete work is shown on drawings and in schedules and includes:

1. Wall Panels.
2. Stair Walls.
3. Exterior Stairs.
4. Fence Piers.
5. Miscellaneous Architectural Trim.

B. Architectural precast concrete includes: Plain units, integrally colored; with abrasive blast finish.

1. Color and Texture to match existing granite trim.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. UNIT MASONRY: Installation in masonry.
B. JOINT SEALERS.

1.04 SUBMITTALS:

A. Product Data: Specifications, data and instructions for manufactured materials and products. Include mix designs, certifications and laboratory test reports as required.

1. Include water absorption test reports for units with exterior exposure.

B. Shop Drawings: Showing complete information for fabrication and installation of precast concrete units, including special reinforcement and lifting devices necessary for handling and erection.

1. Show layout, dimensions, and identification of each unit corresponding to sequence and procedure of installation.
2. Indicate welded connections by AWS standard symbols. Detail inserts, connections, and joints, including accessories and construction at opening in precast units.

C. Samples: Approximately 12"x2"x2" to illustrate quality, color, and texture of surface finish; cast-in anchorages, attachements and accessories requested by Architect.

1. Prepare full-size sample of each type of unit for Architect's inspection prior to start of installation work,, and after Architect's review of finish samples. Acceptable full-size

samples amy be incorporated in job installation.

1.05 QUALITY ASSURANCE:

A. Codes and Standards: Comply with following codes, specifications and standards:

1. ACI 318 "Building Code Requirements for Reinforced Concrete".
2. Concrete Reinforcing Steel Institute, "Manual of Standard Practice".
3. Prestressed Concrete Institute MNL 117, "Manual for Quality control for Plants and Production of Architectural Precast Concrete Products".
4. American Welding Society D1.4, "Structural Welding Code - Reinforcing Steel".

B. Fabricator Qualifications: Minimum of 5 years successful experience in the fabrication of architectural precast concrete units, similar to units required for this project. Must have sufficient production capacity to produce, transport, and deliver required units without causing delay in work.

1. Fabricator must be producer member of Precast Concrete Institute (PCI) and/or participate in its Plant Certification Program.

C. Design modifications may be made only as necessary to meet field conditions and to ensure proper fitting of work, and only as acceptable to Architect. Maintain general design concept shown without increasing or decreasing sizes of members or altering profiles and alignment shown. Provide complete design calculations and drawings prepared by a professional engineer registered in state where project is located, if design modifications are anticipated.

D. Qualifications of Erector: Minimum of 5 years successful experience in the erection of architectural precast concrete units, similar to units required for this project.

1.06 DELIVERY, STORAGE AND HANDLING: Deliver units to project site in quantities and at times to assure continuity of installation. Store units at project site to prevent cracking, distortion, warping, staining, or other physical damage and so that markings are visible. Lift and support units only at designated lifting or supporting points as shown on final shop drawings.

PART 2 PRODUCTS

2.01 FORMWORK:

A. Provide forms of metal, plastic, wood, or other acceptqable material that is non-reactive with concrete and will produce required finish surfaces.

B. Accurately construct forms, mortar-tight, and of sufficient strength to withstand pressures due to concrete placing operations and temperature changes. Maintain form work to provide completed units of shapes, lines and dimensions indicated, within specified fabrication tolerances.

2.02 REINFORCING MATERIALS:

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Supports for Reinforcement: Provide supports for reinforcement innicuding bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing.

1. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

2.03 CONCRETE MATERIALS:

A. Portland Cement: ASTM A 150, Type I or Type III. Use one brand throughout project.

B. Coarse Aggregate for Facing Mixes: ASTM C 33 for "Severe Weathering Region"; hard, durable, carefully selected and graded; free of material causing staining or reacting with cement and with less than 5% magnesium sulfate.

C. Fine Aggregate for Facing Mixes: ASTM C 33; manufactured sand of same material as coarse aggregate.

D. Pigments: Non-fading, resistant to lime and other alkalies.

E. Water: Drinkable, free from foreign materials harmful to concrete and embedded steel.

F. Air-Entraining Admixtures: ASTM C 260.

G. Water-Reducing Retarding, Accelerating Admixtures: ASTM C 494, Type as selected by Fabricator and containing not more than 0.1% chloride irons.

2.04 CONNECTION MATERIALS:

A. Steel Plates: Structural quality, hot-rolled carbon steel, ASTM A 283, Grade C.

B. Steel Shapes: ASTM A 36.

C. Stainless Steel Shapes: AISI type 302/304.

D. Anchor Bolts: ASTM A 307, low-carbon steel bolts, regular hexagon nuts and carbon steel washers.

E. Electrodes for Welding: Comply with AWS Code.

F. Finish of Steel Units: Exposed units hot-dip galvanized after fabrication, ASTM A 153; inserts cast into precast units hot-dip galvanized, electro-galvanized or cadmium coated; others shop painted with rust-inhibitive primer.

2.05 GROUT MATERIALS:

A. Non-Metallic Shrinkage-Resistant Grout: Pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-C621.

B. Products: Subject to compliance with requirements, provide one of the following:

1. Euco No.S.; Euclid Chemical Co.
2. Masterflow 713; Master Builders.
3. Five Star Grout; U.S. Grout Corp.

2.06 PROPORTIONING AND DESIGN OF MIXES:

A. Prepare design mix for type of concrete required.

B. Design mix may be prepared by independent testing facility or by qualified precast manufacturering plant personnel, at precast fabricator's option.

C. Proportion mix by either laboratory trial batch or field experience methods, using materials to be employed on the project for each type of concrete required, complying with ACI 318.

D. Mix: Standard-weight concrete consiting of specified portland aggregates, pigments, admixtures, and water to produce the following properties:

1. Compressive Strength: 5,000 psi minimum at 28 days.
2. Total Air Content: Not less than 4% nor more than 6%.
3. Water Absorption: Not to exceed 5% to 6% by weight; except between 3% to 4% for sloping surfaces (sills), for improved weathering and staining resistance.
4. Color as selected by Architect; to match color of existing granite trim.

E. Submit written reports to Architect of proposed mix for each type of concrete at least 15 days prior to start of precast unit production. Do not begin concrete production until mixes and evaluations have been reviewed by Architect.

F. Adjustment to Concrete Mixes: Mix design adjustments may be requested when characteristics of materials, job conditions, weather, test results, or other circumstances warrant. Laboratory test data for revised mix designs and strength results must be submitted to and accepted by Architect before using in the work.

G. Admixtures: Use air-entraining admixture in strict compliance with manufacturer's directions. Admixtures to increase cement dispersion, or provide increased workability for low-slump concrete, may be used subject to Architect's acceptance.

1. Use amounts as recommended by admixture manufacturer for climatic conditions prevailing at time of placing. Adjust quantitites of admixtures as required to maintain quality control.

2.07 FABRICATION: Fabricate precast concrete units complying with manufacturing and testing procedures, quality control recommendations, and following dimensional tolerances.

A. Dimensional Tolerances of Finished Units: Overall height and width measured at face adjacent to mold at time of casting:

1. 10' or under: plus or minus 1/8".
2. 10' to 20': plus 1/8", minus 3/16".
3. 20' to 30': plus 1/8",, minus 1/4".
4. Each additional 10': plus or minus 1/16" per 10'.
5. Angular deviation of plane of side mold: 1/32" per 3" depth, or 1/16" total, whichever is greater.

6. Openings within one unit: plus or minus 1/4", except plus or minus 1/8" for windows and door frames.
7. Out of square (difference in length of two diagonal measurements): 1/8" per 6' or 1/4" total, whichever is greater.
8. Thickness: minus 1/8", plus 1/4".
9. Tolerances: of other dimensions not otherwise indicated: numerically greater of plus or minus 1/16" per 10', or plus or minus 1/8".

B. Position Tolerances: For cast-in items measured from datum line locations as shown on reviewed shop drawings:

1. Anchors and inserts: within 3/8" of centerline location.
2. Blockouts and reinforcements: within 1/4" of position shown on shop drawings, where such positions have structural implications or affect concrete cover; othewise within plus or minus 1/2".

C. Fabricate units straight, smooth, and true to size and shape, with exposed edges and corners precise and square unless otherwise indicated.

1. Precast units which are warped, cracked, broken, spalled, stained, or otherwise defective will not be acceptable.

D. Expansion Joints: Free of grout, mortar, or other obstructions to expansive movement, with expansion joint filler; where indicated.

E. Built-In Items: Provide reglets, slots, holes, and other accessories in units to receive cramps, dowels, reglets, waterstops, flashings, and other similar work as indicated.

F. Anchorages: Provide loose steel plates, clip angles, seal angles, anchors, dowels, cramps, hangers, and other miscellaneous steel shapes necessary for securing precast units to supporting and adjacent members.

G. Surface Finish: Provide medium abrasive blast finish, using abrasive grit, equipment, application techniques and cleaning to expose aggregate and surrounding matrix surfaces, to match Architect's control sample.

1. Texture to match finish on existing granite.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which the work is to be performed. Do not proceed with the work until unsatifactory conditions have been corrected in an acceptable manner.

3.02 INSTALLATION:

A. General: Deliver anchorage items to be embedded in other construction before start of work. Provide setting diagrams, templates, instructions and directions as required for installation.

B. Do not install precast units until concrete has attained its design compressive strength.

C. Install precast concrete memebers plum, level, and in alignment with PCI MNL-117 and specified limits of erection tolerances. Provide temporary supports and bracing as required to maintain position, stability and alignment as members are being permanently connected.

1. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.

D. Acessories: Install clips, hangers, and other accessories required for erection of precast units to supporting members and back-up materials.

E. Anchor units in final position by bolting, welding, grouting, or as otherwise indicated. Remove temporary shims, wedges, and spacers as soon as possible after anchoring is completed.

1. At bolted connections use lock washers or other acceptable means to prevent loosening of nuts.
2. At welded connections apply rust-inhibitive coating on damaged areas, same as shop-applied material. Use galvanizing repair coating on galvanized surfaces.

F. Cleaning: Clean exposed facings to remove dirt and stains on units after erection and completion of joint treatments. Wash and rinse in accordance with precast manufacturer's recommendations. Protect other work from damage due to cleaning operations. Do not use cleaning materials or processes which could change the character of exposed concrete finishes.

3.03 ERECTION TOLERANCES:

A. Warpage: Fabricate and install wall panels so that each panel after erection complies with following dimensional requirements.

1. Bowing (concave or convex) or any part of a flat surface not to exceed lenth of bow/360, with a maximum of 3/4" up to 30'.
2. Maximum warpage of one corner out of plane of other three, the greater of 1/16" per foot distance from nearest adjacent corner, or 1/8".

B. Tolerances for Location of Precast Units: Fabricate and erect precast units so that joints between panels meet the following:

1. Face width of joints: plus or minus 3/16".
2. Joint taper: 1/40" per foot length, with maximum length of tapering in one direction of 10'.
3. Step in face: 1/4"
4. Jog in alignment of edge: 1/4".
5. Alignment for exterior panels is outside face.
6. Variation from plumb: plus or minus 1/2" in any 40' run.
7. Variation from level: plus or minus 1/2" in any 40' run.

3.04 PERFORMANCE REQUIREMENTS:

A. Conduct inspections, perform testing, and make repairs or replace unsatisfactory precast units as required.

1. Amount of patching which will be permitted is subject to acceptance of Architect.

B. In addition to above, in-place precast units may be rejected for any one of the following:

1. Exceeding specified installation tolerances.
2. Damaged during constructin operations.
3. Exposed-to-view surfaces which develop surface finish deficiencies.
4. Other defects as listed in PCI MNL-117.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements.

1.02 DESCRIPTION OF WORK:

A. Extent of each type of masonry work is indicated on drawings and schedules.

B. Unit masonry includes:

1. Concrete unit masonry.
2. Brick masonry.
3. Precast concrete trim.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. MASONRY RESTORATION AND CLEANING
B. METAL FABRICATIONS: Lintels
C. JOINT SEALERS: Control and expansion joint sealant.

1.04 QUALITY ASSURANCE:

A. Fire Performance Characteristics: Where fire-resistance ratings are indicated for unit masonry work, provide materials and construction which are identical to those of assemblies whose fire endurance has been determined by testing in compliance with ASTM E 119 by a recognized testing and inspecting organization or by another means, as acceptable to authority having jurisdiction.

1.05 SUBMITTALS:

A. Product Data: Submit manufacturer's product data for each type of masonry unit, accessory, and other manufactured products, including certifications that each type complies with specified requirements.

B. Samples: Submit, for verification purposes, samples of each exposed masonry unit and colored masonry mortar. Include in each set of samples the full range of exposed colors and textures to be expected in completed work.

1. For initial selection of exposed masonry units and colored masonry mortar, submit samples showing full range of colors and textures available.
2. For verification purposes submit the following:
   a. Facing brick samples for type of exposed brick required. Include in each set the full range of exposed color and texture to be expected in the completed work.
   b. Colored masonry mortar samples for each color required showing the full range of color which can be expected in the finished work. Label samples to indicate type and amount of colorant used.

C. Wall flashing, 12" square.

1.06 DELIVERY AND STORAGE:

A. Deliver masonry materials to project in undamaged condition.

B. Store and handle masonry units to prevent their deterioration or damage due to moisture, temperature, temperature changes, contaminants, corrosion or other causes.

1. Limit moisture absorption of concrete masonry units during delivery and until time of installation to the maximum percentage specified for Type I units for the average annual relative humidity as reported by the U.S.Weather Bureau Station nearest project site.

C. Deliver cements and limes in original sealed containers bearing the name and brand of the manufacturer. Store in a dry area. Defective, partially set or caking cements or limes are not acceptable.

D. Store aggregates where grading and other required characteristics can be maintained.

E. Store masonry accessories including metal items to prevent deterioration by corrosion and accumulation of dirt.

1.07 JOB CONDITIONS:

A. Protection of Work: During erection, cover top of walls with heavy waterproof sheeting at end of each day's work. Cover partially competed structures when work is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.

B. Do not apply uniform floor or roof loading for a least 12 hours after building masonry walls or columns.

C. Do not apply concentrated loads for at least 3 days after building masonry walls or columns.

D. Staining: Prevent grout or mortar or soil from staining the face of masonry to be left exposed or painted. Remove immediately grout or mortar in contact with such masonry. Protect base of walls form rainsplashed mud and mortar splatter by means of coverings spread on ground and over wall surface.

1. Protect sills, ledges and projections from dropping of mortar.

E. Cold Weather Protection:

1. Do not lay masonry units which are wet or frozen.

2. Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.
3. Remove masonry determined to be damaged by freezing conditions.
4. Protect against freezing when temperature is 40 degrees and falling. Heat materials and cover completed work. Comply with governing regulations and with "Cold-Weather Masonry Construction" by Brick Institute of America.

PART 2 PRODUCTS

2.01 MASONRY UNITS, GENERAL:

A. Manufacturer: Obtain masonry units from one manufacturer, of uniform texture and color for each kind required, for each continuous area and visually related areas.

B. Masonry Unit Characteristics: Provide units complying with standards referenced and requirements indicated.

2.02 BRICK:

A. Size: Provide bricks manufactured to the following actual dimensions: Match dimensions of existing brick.

B. For sills, caps and similar applications resulting in exposure of brick surfaces which otherwise would be concealed from view, provide uncored or unfrogged units with all exposed surfaces finished.

C. Facing Brick: ASTM C216, and as follows:

1. Grade SW.
2. Type FBS.
3. Application: Use where brick is exposed, unless otherwise indicated.
4. Allowance: Provide on allowance of $400.00 per thousand for brick delivered and stacked at the project site.

D. Building Brick: ATM C 62, Grade SW.

1. Application: Use where brick is indicated for concealed locations.

2.03 CONCRETE MASONRY UNITS:

A. Size: Manufacturer's standard units with nominal face dimensions of 16" long x 8" (15-5/8" x 7-5/8" actual), unless otherwise indicated.

B. Special Shapes: Provide where required for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.

C. Hollow Load-Bearing CMU: ASTM C 90 where shown and as follows:

1. Grade N.

D. Solid Loadbearing CMU: ASTM C145, where shown as "Solid".

   1. Grade N.

E. Weight Classification: Light weight units.

F. Cure units in a moisture-controlled atmosphere or in an autoclave at normal pressure and temperature to comply with ASTM C 90, Type 1.

   1. Limit moisture absorption during delivery and until time of installation to the maximum percentage specified for Type 1 units for the average annual relative humidity as reported by the U.S. Weather Bureau Station nearest the project site.

G. Exposed Faces: Provide manufacturer's standard color and texture, unless otherwise indicated.

   1. Provide texture and finish to match adjacent block in existing masonry.

2.04 PRECAST CONCRETE: Factory fabricated units of 5000 psi air-entrained (4 to 6%) standard weight concrete, cast to profiles and sizes indicated, colored with commercial masonry pigments as selected, lightly sandblasted on exposed surfaces; complying with PCI MNL-117 tolerances and cured for not less than 30 days before installation.

2.05 MORTAR MATERIALS:

A. Portland Cement: ASTM C 150, Type I, except Type III may be used for cold weather construction. Provide natural color or white cement as required to produce required mortar color.

B. Masonry Cement: ASTM C91.

   1. For colored pigmented mortars use premixed colored masonry cements of formulation required to produce color, as selected from manufacturer's standard formulations.
   2. Products: Subject to compliance with requirements, provide one of the following:
      a. Atlas Custom Color Masonry Cement; Lehigh Portland Cement Co.
      b. Flamingo Color Masonry Cement; The Riverton Corporation.

C. Hydrated Lime: ASTM C 207, Type S.

D. Aggregate for Mortar: ASTM C 144, except for joints less than 1/4" use aggregate graded with 100% passing the No. 16 sieve.

E. Water: Clean and potable.

2.06 JOINT REINFORCEMENT, TIES AND ANCHORING DEVICES:

A. Materials: Comply with requirements indicated below for basic materials and with requirements indicated under each form of joint reinforcement, tie and anchor for size and other characteristics:

1. Zinc-Coated (galvanized) Steel Wire: ASTM A 82 for uncoated wire and with ASTM C 641 for zinc coating of class indicated below:
   a. Class 1 (0.40 oz. per sq. ft. of wire surface).
   b. Application: Use for masonry not exposed to exterior or earth.
2. Hot-Dip Galvanized Steel Wire: ASTM A 82 for uncoated wire and with ASTM A 123, Class B-2 (1.5 oz. per sq. ft. of wire surface) for zinc coating applied after prefabrication into units.
   a. Application: Use for unit masonry exposed to exterior and in contact with earth.
3. Hot-Dip Galvanized Carbon Steel Sheet: ASTM A 366, Class 2 or ASTM A 635; hot-dip galvanized after fabrication to comply with ASTM A 153, Class B.
   a. Application: Use for unit masonry anchors.

B. Joint Reinforcement: Provide welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10', with prefabricated corner and tee units, and complying with requirements indicated below:

1. Width: Fabricate joint reinforcement in units with widths of approximately 2" less than nominal width of walls and partitions as required to provide mortar coverage of not less than 5/8" on joint faces exposed to exterior and 1/2" elsewhere.
   a. Wire Size for Rods: 9 gage.
2. For single-wythe masonry provide type as follows with single pair of side rods:
   a. Ladder design with perpendicular cross rods spaced not more than 16" o.c.

C. Bent-Wire Ties: Provide individual prefabricated bent-wire units complying with requirements indicated below:

1. Wire Size: 0.1875" diameter.
2. Length: Provide units of length indicated but not less than that required for embedment into each wythe of 1.5" for solid units and for embedment of tie end into face shells of hollow units, with not less than 5/8" mortar cover on exterior face joints, 1/2" wide elsewhere.
3. Tie Shape for Hollow Masonry Units Laid with Cells Vertical: Rectangular with ends welded close and not less than 2" wide.
4. Tie Shape for Solid Masonry Unit Construction: Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2" long.
5. Where facing and backup do not align, provide either offset or adjustable 2 piece ties.

D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. AA Wire Products Co.
2. Dur-O-Wall, Inc.
3. Heckman Building Products, Inc.
4. Masonry Reinforcing Corp. of America.

2.07 CONCEALED FLASHING MATERIALS:

A. Asphalt-Coated Copper Flashing: Manufacturer's standard product consisting of sheet copper of weight per sq. ft. indicated below coated with flexible fibrated asphalt.

   1. Weight: 5 oz.

B. Adhesive for Flashings: Of type recommended by manufacturer of flashing material for use indicated.

C. Products: Subject to compliance with requirements, provide one of the following:

   1. "Cop-A-Cote"; Afco Products Inc.
   2. Coated Copper Flashing; Sandell Manufacturing Co., Inc.
   3. "Copperseal"; York Manufacturing, Inc.

2.08 MISCELLANEOUS MASONRY ACCESSORIES:

A. Reinforcing Bars: Deformed steel, ASTM A 615, Grade 60 for bars No. 3 to No.18.

B. Bond Breaker Strips: Asphalt-saturated organic roofing felt complying with ASTM D 226, Type 1 (No. 15 asphalt felt).

C. Weepholes Cotton Cord: Sash cord of length required to produce 2" exposure on exterior and 18" in cavity between wythes.

2.09 MASONRY CLEANERS:

A. Job-Mixed Detergent Solution: Solution of trisodium phosphate (1/2 cup dry measure) and laundry detergent (1/2 cup dry measure dissolved in one gallon of water.

B. Acidic Cleaner: Manufacturer's standard strength general purpose cleaner designed for new masonry surfaces of type indicated; composed of blended organic acids combined with special wetting systems and inhibitors; expressly approved for intended use by manufacturer of masonry units being cleaned.

2.10 MORTAR AND GROUT MIXES:

A. General: Do not add admixtures including coloring pigments, air entraining agents, accelerators, retarders, water repellent agents, antifreeze compound or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.

B. Mixing: Combine and thoroughly mix cementitious, water and aggregates in a mechanical batch mixer; comply with referenced ASTM standards for mixing time and water content.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, for types of mortar required, unless otherwise indicated.

1. Limit cementitious materials in mortar to portland cement-lime.
2. Use Type N mortar; except type M for horizontal surfaces.

D. Mortar for Existing Unit Masonry: Provide mortar to match original mortar in color, texture, strength and hardness (density and porosity).

1. Determine existing mortar mix constituents and ratios by laboratory analysis. Review evaluations with Architect before proceeding with work.
2. Match color of existing mortar by use of natural aggregates where possible. Use inorganic coloring pigments if satisfactory color cannot be attained with natural materials.

E. Colored Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required. Do not exceed pigment-to-cement ratio of 1-to-10, by weight.

1. Mix to match Architect's sample.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which unit masonry work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 INSTALLATION, GENERAL:

A. Wetting Clay Brick: Wet brick made from clay or shale which have ASTM C 67 initial rates of absorption (suction) of more than 30 grams per 30 sq. in. per minute. Use wetting methods which ensure each clay masonry unit being nearly saturated but surface dry when laid.

B. Do not wet concrete masonry units.

C. Cleaning Reinforcing: Before placing, remove loose rust, ice and other coatings from reinforcing.

D. Thickness: Build cavity and composite walls, and other masonry construction to the full thickness shown. Build single-wythe walls (if any) to the actual thickness of the masonry units, using of nominal thickness indicated.

E. Build chases and recesses as shown or required for the work of other trades. Provide not less than 8" of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.

F. Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.

G. Cut masonry units using motor-driven saws to provide clean, shrap, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining work. Use full-size units without cutting where possible.

1. Use dry cutting saws to cut concrete masonry units.

3.03 CONSTRUCTION TOLERANCES:

A. Variation from Plumb: For vertical lines and surfaces of columns, walls and arrises do not exceed 1/4" in 10' or, 3/8" in a story height not to exceed 20', nor 1/2" in 40' or more. For external corners, expansion joints, control joints and other conspicuous lines, do not exceed 1/4" in any story of 20' maximum, nor 1/2" in 40' or more. For vertical alignment of head joints do not exceed plus or minus 1/4" in 10', 1/2" maximum.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, do to exceed 1/4" in any bay or 20' maximum, nor 1/2" in 40' or more. For top surface of bearing walls do not exceed 1/8" between adjacent floor elements in 10' or 1/16" within width of a single unit.

C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls and partitions, do not exceed 1/2" in any bay or 20' maximum, nor 3/4" in 40' or more.

D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4" nor plus 1/2".

E. Variation in Mortar Joint Thickness: Do not exceed bed joint thickness indicated by more than plus or minus 1/8", with a maximum thickness limited to 1/2". Do not exceed head joint thickness indicated by more than plus or minus 1/8".

3.04 LAYING MASONRY WALLS:

A. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to accurately locate openings, movement type joints, returns and offsets. Avoid the use of less-than-half-size units at corners, jambs and wherever possible at other locations.

B. Lay-up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other work.

C. Pattern Bond: Lay exposed masonry in the bond pattern shown or, if not shown, lay in running bond with vertical joint in each course centered on units in courses above and below. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2". Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4" horizontal face dimension at corners or jambs.

D. Stopping and Resuming Work: Rack back 1/2-unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if required) and remove loose masonry units and mortar prior to laying fresh masonry.

E. Built-in-Work: As the work progresses, build-in items specified under this and other sections of these specifications. Fill in solidly with masonry around built-in items.

1. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.
2. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
3. Fill cores in hollow concrete masonry units with grout 3 courses (24") under bearing plates, beams, lintels, posts and similar items, unless otherwise indicated.

3.05 MORTAR BEDDING AND JOINTING:

A. Lay solid brick size masonry units with completely filled bed and head joint; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.

B. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and in all courses. of piers, columns and pilaster, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.

C. Set precast units in full bed of mortar with all vertical joints slushed full. Fill dowel, anchor and similar holes solid. Wet joint surface thoroughly before setting; for surfaces which are soiled, clean bedding and exposed surfaces with fiber brush and soap powder followed, by thorough rinsing with clean water.

D. Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not shown, lay walls with 3/8" joints.

E. Cut joints flush for masonry walls which are to be concealed or to be covered by other materials, unless otherwise indicated.

F. Tool exposed joints slightly concave using a jointer larger than joint thickness, unless otherwise indicated.

G. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners or jambs to shift adjacent stretcher units which have been set in position. If adjustment are required, remove units, clean off mortar and reset in fresh mortar.

3.06 CAVITY WALLS:

A. Keep cavity clean of mortar droppings and other materials during construction. Strike joints facing cavity flush.

B. Provide weep holes in exterior wythe of cavity wall located immediately above ledges and flashing, spaced 2'-0" o.c., unless otherwise indicated.

3.07 HORIZONTAL JOINT REINFORCEMENT:

A. General: Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8" on exterior side of walls, 1/2" elsewhere. Lap reinforcing a minimum of 6".

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Reinforce walls with continuous horizontal joint reinforcing unless specifically noted be omitted.

D. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

E. Space continuous horizontal reinforcement as follows:

1. For single-wythe walls, space reinforcement at 16" o.c. vertically.
2. For parapets, space reinforcement at 8" o.c. vertically.

F. Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcement placed in 2 horizontal joints approximately 8" apart, immediately above the lintel and immediately below the sill. Extend reinforcement a minimum of 2'-0" beyond jambs of the opening except at control joints.

3.08 VERTICAL JOINT REINFORCEMENT:

A. Position reinforcing accurately at spacing shown. Support bars against displacement. Provide a clear distance between bars of not less than 1".

B. Splice reinforcing bars where shown only. Provide lapped splices unless otherwise shown and attach to dowels by placing in contact and wire tying.

C. Maintain vertical continuity of core cavities to be reinforced and grouted; provide minimum clearance and grout coverage for reinforcing bars.

D. Solidly bed webs in mortar where adjacent to reinforcing cores.

E. Solidly grout reinforcing in cells of each successive course. Rod grout after placement to ensure bonding to reinforcing bars.

3.09 ANCHORING MASONRY WORK:

A. General: Provide anchor devices of type indicated.

B. Space anchors as indicated but not more than 16" o.c. vertically and 24" o.c. horizontally. Install additional anchors within 1'-0" of openings and at intervals around perimeter not exceeding 3'-0".

3.10 CONTROL AND EXPANSION JOINTS:

A. General: Provide vertical and horizontal expasion, control and isolation joints in masonry where shown. Build-in related items as the masonry work progresses.

B. Build flanges of factory-fabricated expansion joint units into masonry work progresses.

C. Build-in joint fillers where indicated.

D. Build-in horizontal pressure relieving joints where indicated; construct joints by inserting compressible joint filler of width required to permit installation of sealant and backer rod.

E. Control joint Spacing: If location of control joint is not shown, place vertical joints not to exceed 40'-0" o.c.

3.11 LINTELS:

A. Install steel lintels where indicated.

B. Provide masonry lintels where shown and wherever openings of more than 1"-0" for brick size units and 2'-0" for block size units are shown without structural steel or other supporting lintels. Provide precast or formed-in-place masonry lintels. Cure precast lintels before handling and installation. Temporarily support formed-in-place lintels.

1. For hollow concrete masonry unit walls, use specially formed U-shaped lintel units with reinforcement bars placed as shown filled with coarse grout.

C. Provide minimum bearing of 8" at each jamb, unless otherwise indicated.

3.12 FLASHING OF MASONRY WORK:

A. General: Provide concealed flashing in masonry work at, or above, shelf angles, lintels, ledges and other obstructions to the downward flow of water in the wall so as to divert such water to the exterior. Prepare masonry surfaces smooth and free from projections which could puncture flashing. Place through-wall flashing on sloping bed of mortar and cover with mortar. Seal penetrations in flashing with mastic before covering with mortar. Extend flashing through exterior face of masonry and turn down to form drip.

B. Extend flashing the full length of lintels and shelf angles and minimum of 4" into masonry each end. Extend flashing from exterior face of outer wythe of masonry, through the outer wythe, turned up a minimum of 4", and through the inner wythe to within 1/2" of the interior face of the wall in exposed work. Where interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2". At heads and sills turn up ends not less than 2" to form a pan.

C. Install flashing to comply with manufacturer's instructions.

D. Provide weep holes in the head joints of the first course of masonry immediately above concealed flashings. Space 24" o.c., unless otherwise indicated.

E. Install reglets and nailers for flashing and other related work where shown to be built into masonry work.

3.13 REPAIR, POINTING AND CLEANING:

A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up all joints including corners, openings and adjacent work to provide a neat, uniform appearance, prepared for application of sealants.

C. Final Cleaning: After mortar is thoroughly set and cured, clean masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave 1/2 panel uncleaned for comparsion purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent precast concrete and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film or waterproof masking tape.

4. Saturate wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Use bucket and brush hand cleaning method described in BIA "Technical Note. No. 20 Revised" to clean brick masonry made from clay or shale, except use masonry cleaner indicated below.
   a. Detergent.
   b. Acidic cleaner; apply in compliance with directions of cleaner manufacturer.

D. Clean concrete unit masonry to comply with masonry manufacturer's directions and applicable NCMA "Tek" bulletins.

E. Protection: Provide final protection and maintain conditions in a manner, which ensures unit masonry work being without damage and deterioration at time of substantial completion.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements apply to the work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of masonry restoration work is indicated on drawings and in schedules.

B. Masonry restoration work includes:

1. Repairing damaged masonry.
   a. Damaged masonry is defined as masonry which is cracked, spalled or otherwise deteriorated in a manner to allow pentration of water into building.
2. Repointing mortar joints.
   a. Repointing is required of 25% of exterior brick surfaces.
3. Cleaning exposed masonry surfaces.
   a. Cleaning is required of exterior masonry surfaces except for tower turrets.
4. Applying graffiti control.
   a. Graffiti control is required around masonry perimeter of building of a height of 8 feet above grade.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. UNIT MASONRY: Masonry construction.
B. JOINT SEALANTS: Control joint sealants.

1.04 QUALITY ASSURANCE:

A. Restoration Specialist: Work performed by a firm having not less than 5 years successful experience in comparable masonry restoration projects.

B. Field-Constructed Mock-Ups: Prior to start of masonry restoration, prepare the following sample panels on building where directed by Architect. Obtain Architect's acceptance of visual qualities before proceeding with the work. Retain acceptable panels in undisturbed condition, suitably marked, during construction as a standard for judging completed work.

1. Cleaning: Demonstrate materials and methods to be used for cleaning type of masonry surface and condition on sample panel of approximately 25 sq. ft. in area.
   a. Test adjacent non-masonry materials for possible reaction with cleaning materials.
   b. Allow waiting period of not less than 7 calendar days, after completion of sample cleaning to permit study of sample panels for negative reactions.

2. Repointing: Prepare 2 separate sample areas of approximately 3' high by 6' wide for type of repointing required, one for demonstrating methods and quality of workmanship expected in removal of mortar from joints and the other for demonstrating quality of materials and workmanship expected in pointing mortar joints.
3. Masonry Repair: Prepare sample panel of approximately 3' high by 6' wide for type of masonry material indicated to be patched, rebuilt or replaced. Erect mock-up panel into an existing wall, to demonstrate quality of materials and workmanship.

C. Source of Materials: Obtain materials for masonry restoration from a single source for each type material required (face brick, cement, sand, etc.) to ensure match of quality, color, pattern, and texture.

1.05 SUBMITTALS:

A. Product Data: Submit manufacturers' technical data for each product indicated including recommendations for their application and use. Include test reports and certifications substantiating that products comply with requirements.

B. Restoration Program: Submit written program for each phase of restoration process including protection of surrounding materials on building and site during operations. Describe in detail materials, methods and equipment to be used for each phase of restoration work.

C. Samples: Submit, for verification purposes, prior to mock-up erection, samples of the following:

1. Each new exposed masonry material to be used for replacing existing materials. Include in each set of samples the full range of colors, and textures to be expected in completed work.
   a. For bricks provide straps or panels containing not less than 4 units.
2. Type of mortar for pointing and masonry rebuilding and repair, in form of 6" long by 1/2" wide sample strips of mortar set in aluminum or plastic channels.

1.06 DELIVERY, STORAGE AND HANDLING:

A. Carefully pack, handle, and ship masonry units and accessories strapped together in suitable packs or pallets or in heavy cartons. Unload and handle to prevent chipping and breakage.

B. Deliver other materials to site in manufacturer's original and unopened containers and packaging, bearing labels as to type and names of products and manufacturers.

C. Protect masonry restoration materials during storage and construction from wetting by rain, snow or ground water, and from staining or intermixture with earth or other types of materials.

D. Protect grout, mortar and other materials from deterioration by moisture and temperature. Store in a dry location or in waterproof containers. Keep containers tightly closed and away from open flames. Protect liquid components from freezing. Comply with manufacturer's recommendations for minimum and maximum temperature requirements for storage.

1.07 PROJECT CONDITIONS:

A. Protect persons, motor vehicles, surrounding surface of building whose masonry surfaces are being restored, building site, and surrounding buildings from injury resulting form masonry restoration work.

   1. Prevent chemical cleaning solutions from coming into contact with pedestrians, motor vehicles, landscaping, buildings and other surfaces which could be injured by such contact.
   2. Do not clean masonry during winds of sufficient force to spread cleaning solutions to unprotected surfaces.
   3. Dispose of run-off from cleaning operations by legal means and in manner which prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.
   4. Erect temporary protection covers over pedestrian walkways and at points of entrance and exit for persons and vehicles which must remain in operation during course of masonry restoration work.

B. Clean masonry surfaces only when air temperatures are 40 degrees F (4 degrees C) and above and will remain so until masonry has dried out, but for not less than 7 days after completion of cleaning.

C. Do not repoint mortar joints or repair masonry unless air temperatures are between 40 degrees F (4 degrees C) and 80 degrees F (27 degrees C) and will remain so for at least 48 hours after completion of work.

D. Prevent grout or mortar used in repointing and repair work from staining face of surrounding masonry and other surfaces. Remove immediately grout and mortar in contact with exposed masonry and other surfaces.

E. Protect sills ledges and projections from mortar droppings.

1.08 SEQUENCING/SCHEDULING:

A. Perform masonry restoration work in the following sequence:

   1. Repair existing masonry including replacing existing masonry with new masonry materials.
   2. Rake-out existing mortar from joints indicated to be repointed.
   3. Repoint existing mortar joints of masonry indicated to be restored.
   4. Clean existing masonry surfaces.
   5. Apply graffiti control.

PART 2 PRODUCTS

2.01 MASONRY MATERIALS:

A. Face Brick and Accessories: Provide face brick and accessories, and other special ground, cut, or sawed shapes where required to complete masonry restoration work.

   1. Provide units with color, surface texture and size to match existing brick work and with physical properties not less than those of existing units.

B. Building Brick: Provide building brick complying with ASTM C 62 for masonry work concealed from view, of same vertical dimension as face brick.

C. Concrete Masonry Units: Provide concrete masonry units and accessories of shapes and sizes required to complete masonry restoration.

   1. Provide units with color, surface texture and size to match existing concrete units with physical characteristics not less than those of existing units.

2.02 MORTAR MATERIALS:

A. Portland Cement: ASTM C 150, Type I.

   1. Provide non-staining white cement complying with staining requirement of ASTM C 91 for not more than 0.30% water soluble alkali.

B. Hydrated Lime: ASTM C 207, Type S.

C. Aggregate for Mortar: ASTM C 144.

   1. Colored Mortar Aggregate: Natural or manufactured sand selected to produce mortar color indicated.
   2. Match Size, texture and gradation of existing mortar as closely as possible.

D. Colored Mortar Pigment: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with record of satisfactory performance in masonry mortars.

E. Water: Clean, free of oils, acids, alkalis and organic matter.

2.03 CLEANING MATERIALS AND EQUIPMENT:

A. Water for Cleaning: Clean, potable, free of oils, acids, alkalis, salts, and organic matter.

B. Brushes: Fiber bristle only.

C. Acidic Cleaner: Manufacturer's standard strength acidic masonry restoration cleaner composed of hydroflouric acid and combined with special wetting systems and inhibitors.

1. Products: Subject to compliance with requirements, provide "Sure Klean Restoration Cleaner", ProSoCo, Inc.

D. Chemical Paint Remover: Manufacturer's standard thixotropic/alkaline formulation for removing paint coatings, from masonry.

1. Products: Subject to compliance with requirements, provide "Sure Klean Heavy-Duty Paint Stripper"; ProSoCo, Inc.

E. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film forming, strippable masking material for protecting glass, metal and polished stone surfaces from damaging effect of acidic and alkaline masonry cleaners.

1. Product: Subject to compliance with requirements, provide "Sure Klean Acid Stop", ProSoCo, Inc.

F. Graffiti Control: Manufacturer's standard clear, single-part, high solids protective coating formulated for application to exterior masonry.

1. Product: Subject to compliance with requirements, provide "Sure Klean Graffiti Control", ProSoCo, Inc.

G. Spray Equipment: Provide equipment for controlled spray application of water and chemical cleaners, if any, at rates indicated for pressure, measured at spray tip, and for volume.

1. For spray application of chemical cleaners provide low-pressure tank or chemical pump suitable for chemical cleaner indicted, equipped with cone-shaped spray-tip.
2. For spray application of water provide fan-shaped spray-tip which disperses water at angle of not less than 15 degrees.

2.04 MORTAR MIXES:

A. General:

1. Measurement and Mixing: Measure cementitious and aggregate material in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean mechanical batch mixer.

a. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate material together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix which will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 1-to-2 hours. Add remaining water in small portions until mortar of desired consistency is reached. Use mortar within

30 minutes of final mixing; do not retemper or use partially hardened material.

2. Colored Mortar: Produce mortar of color required by use of selected ingredients. Do not adjust proportions without Architect's approval.

    a. Colored Pigmented Mortar: Where colored mortar pigments are indicated do not exceed pigment-to-cement ratio of 1-to-10, by weight.

B. Mortar Proportions: Provide mortar to match original mortar in color, texture, strength and hardness (density and porosity).

1. Determine existing mortar mix constituents and ratios by laboratory analysis. Review evaluations with Architect before proceeding with work.
2. Match color of existing mortar by use of natural aggregates where possible. Use inorganic coloring pigments if satisfactory color cannot be attained with natural materials.

2.05 CHEMICAL CLEANING SOLUTIONS:

A. General: Dilute chemical cleaning materials with water to produce solutions of concentration indicated but not greater than that recommended by chemical cleaner manufacturer.

B. Acidic Cleaner Solution for Brick: Maximum hydrofluoric acid content: 3%.

C. Chemical Paint Remover: In concentration recommended by chemical cleaner manufacturer.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which masonry restoration and cleaning work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 PREPARATION:

A. General: Comply with recommendations of manufacturers of chemical cleaners for protecting building surfaces against damage from exposure to their products.

B. Protect glass, unpainted metal trim and polished stone from contact with acidic chemical cleaners by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape. Apply masking agent to comply with manufacturer's recommendations. Do not apply liquid masking agent to painted or porous surfaces.

3.03 CLEANING EXISTING MASONRY:

A. Cleaning, General:

1. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other.

2. Use only those cleaning methods indicated for masonry material and location.
3. Perform cleaning method indicated in a manner which results in uniform coverage of all surfaces, including corners, moldings, interstices and which produces an even effect without streaking or damage to masonry surfaces.
4. Rinse off chemical residue and soil by working upwards from bottom to top of each treated area at each stage or scaffold setting.

B. Chemical Cleaner Application Methods:

1. General: Apply chemical cleaners to masonry surfaces to comply with chemical manufacturer's recommendations using brush or spray application methods, at Contractor's option. Do not allow chemicals to remain on surface for periods longer than that indicated or recommended by manufacturer.
2. Spray Application: Apply to pressures not exceeding 50 psi, unless otherwise indicated.
3. Reapplication of Chemical Cleaners: Do not apply chemical cleaners to same masonry surfaces more than twice. If additional cleaning is required use steam wash.

C. Chemical Cleaning: At locations indicated, clean masonry surfaces with acidic cleaner applied as follows:

1. Prewet masonry with cold water applied by low pressure spray.
2. Apply acidic cleaner to masonry. Let cleaner remain on surface for period indicated below before rinsing away:
   a. As recommended by chemical cleaner manufacturer.
3. Rinse masonry with cold water to remove chemicals and soil, applied as follows:
4. Repeat chemical cleaning procedure above where required to produce effect established by mock-up. Do not apply more than twice.
   b. High pressure spray.

D. Paint Removal: At locations indicated, remove paint from masonry surfaces as follows:

1. Apply chemical paint remover to painted masonry with brushes.
2. Allow chemical paint remover to remain on surface for period recommended by paint remover manufacturer.
3. Remove chemical and paint residue by rinsing with water applied as follows:
   a. High pressure spray.

E. Graftiti Control: Apply protective coating to cleaned masonry surfaces in accordance with manufacturer's instructions.

3.04 MASONRY REMOVAL AND REBUILDING:

A. Removal:

1. Carefully remove by hand at locations indicated any masonry which are damaged, spalled or deteriorated. Cut out full units from joint to joint and in manner to permit replacement with full size units.
2. Support and protect masonry indicated to remain which surrounds removal area.
3. Salvage as many whole, undamaged units as possible.
4. Remove mortar, loose particles and soil from salvaged masonry by cleaning with brushes and water. Store for reuse.
5. Clean remaining masonry at edges of removal areas by removing mortar, dust, and loose debris in preparation for rebuilding.

B. Rebuilding:

1. Install new or salvaged units to replace removed masonry. Fit replacement units into bonding and coursing pattern of existing. If cutting is required use motor driven saw designed to cut masonry with clean, sharp unchipped edges.
2. Lay replacement units with completely filled bed, head and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet clay brick which have ASTM C 67 initial rates of absorption (suction) of more than 30 grams per 30 sq. in. per minute. Use wetting methods which ensure that units are nearly saturated but surface dry when laid. Maintain joint width for replacment units to match existing.
   a. Do not wet concrete masonry units.
3. Tool exposed mortar joints in repaired areas to match joints of surrounding existing masonry.
4. Repoint new mortar joints in repaired area to comply with requirements for repointing existing masonry, except rake out joints before mortar sets.

3.05 REPOINTING EXISTING MASONRY:

A. Joint Raking:

1. Extent of repointed masonry is indicated on drawings.
2. Rake out mortar from joints to depths equal to 2-1/2 times their widths but not less than 1/2" nor less than that required to expose sound, unweathered mortar.
3. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum or flush joints to remove dirt and loose debris.
4. Do not spall edges of masonry units or widen joints. Replace any masnory units which become damaged.
   a. Cut out old mortar by hand with chisel and mallet, unless

otherwise indicated.

b. Power operated rotary hand saws and grinders will be permitted but only on specific written approval of Architect based on submission by Contractor of a satisfactory quality control program and demonstrated ability of operators to use tools without damage to masonry. Quality control program shall include provision for supervising performance and prevending damage due to worker fatigue.

B. Joint Pointing:

1. Rinse masonry joint surfaces with water to remove any dust and mortar particles. Time application of rinsing so that, at time of pointing, excess water has evaporated or run off, and joint surfaces are damp but free of standing water.
2. Apply first layer of pointing mortar to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8" until a uniform depth is formed. Compact each layer thoroughly and allow to become thumbprint-hard before applying next layer.
3. After joints have been filled to a uniform depth, place remaining pointing mortar in 3 layer with each of first and second layers filling approximately 2/5 of joint depth and third layer the remaining 1/5. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing bricks have rounded edges recess final layer. Where existing bricks have rounded edges recess final layer slightly from face. take care not to spread mortar over edges onto exposed masonry surfaces, or to featheredge mortar.
4. When mortar is thumbprint hard, tool joints to match original appearance of joints, unless otherwise indicated. Remove excess mortar from edge of joint by brushing.
5. Cure mortar by maintaining in a damp condition for not less than 72 hours.
6. Where repointing work precedes cleaning of existing masonry allow mortar to harden not less than 30 days before beginning cleaning work.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1, General Requirements, apply to work of this section.

1.02 DECRIPTION OF WORK:

A. Extent of structural steel work is shown on drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.

B. Structural steel is that work defined in AISC "Code of Standard Practice" and as shown on drawings.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. CAST-IN-PLACE CONCRETE: Installation of anchor bolts.

B. UNIT MASONRY: Installation of beam bearing plates.

C. PAINTING: Painting of steel, except as specified herein.

D. METAL FABRICATIONS: Miscellaneous metal work.

1.04 QUALITY ASSURANCE:

A. Codes and standards: Comply with following, except as otherwise indicated:

1. AISC "Code of Standard Practice for Steel Buildings and Bridges".
   a. Paragraph 4.2.1 of above code is hereby modified by deletion of the following sentence: "This approval constitutes the owner's acceptance of all responsibility for the design adequacy of any connections designed by the fabricator as a part of this preparation of these shop drawings".
2. AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings", including Commentary and Supplements.
3. AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research council on Riveted and Bolted Structural Joints of the Engineering Foundation.
4. AWS D1.1 "Structural Welding Code".
5. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use".

B. Qualifications for Welding Work: Quality processes and operators in accordance with AWS "Standard Qualification Procedure".

1. Provide certification that welders have satisfactorily passed AWS qualification tests.

1.05 SUBMITTALS:

A. Product Data: Specifications and installation instructions for following products. Include laboratory test reports to show compliance with specifications.

1. Structural steel including certified copies covering chemical and physical properties.
2. High-strength bolts including nuts and washers.
3. Structural steel primer paint.
4. Shrinkage-resistant grout.

B. Shop Drawings: Prepared under supervision of registered professional engineer.

1. Include details and pertinent data. Indicate welds by AWS symbols; show size, length, and type of each weld.
2. Provide setting drawings, templates, and directions for anchorages installed by others.

C. Test Reports: Copies conducted on shop and field bolted and welded connections.

1.06 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials to site to insure uninterrupted progress of work.

B. Deliver anchor bolts and anchorage devices in time to not delay work.

C. Store materials to permit access for inspection and identification. Keep members off ground. Protect from erosion and deterioration.

D. Do not store materials on structure to cause distortion or damage. Repair or replace damaged materials as directed.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: For exposed work, use materials smooth and free of surface blemishes. Remove blemishes by welding and grinding, prior to application of surface finishes.

B. Structural Steel Shapes, Plates and Bars: ASTM A 36, unless otherwise indicated.

C. Hot-formed Steel Tubing: ASTM A 501.

D. Anchor Bolts: ASTM A 307, nonheaded type unless otherwise indicated.

E. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:

1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A 325.

F. Electrodes for Welding: Comply with AWS Code.

G. Structural Steel Primer Paint: Red lead-iron oxide, oil alkyd; TT-P-86, Type II.

H. Non-metallic Shrinkage-Resistant Grout: Pre-mixed, non-metallic and complying with CRD-C621.

2.01 FABRICATION:

A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.

B. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence to expedite erection.

C. Where finishing is required, complete assembly including weldings, before start of finishing operations. Provide exposed finish surfaces free of markings and defects.

D. Connections: Weld or bolt shop connections, as indicated.

1. Bolt field connections, except where other connections are indicated.
    a. Provide high-strength threaded fasteners for principal bolted connections.
    b. Provide unfinished threaded fasteners for only bolted connections of secondary members and for temporary bracing.

E. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints" using ASTM A 325 or A 490 Bolts".

F. Welded Construction: Comply with AWS Code.

G. Holes for Other Work: Provide holes for securing other work and for passage of other work through steel as shown on final shop drawings.

1. Cut, drill or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.02 SHOP PAINTING

A. General: Shop paint except members or portions of members to be embedded in concrete. Paint embedded steel to be partially exposed on exposed portions and initial 2" of embedded areas only.

1. Bolt field connections, except where other connections are indicated.
   a. Provide high-strength threaded fasteners for principal bolted connections.
   b. Provide unfinished threaded fasteners for only bolted connections of secondary members and for temporary bracing.

E. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints" using ASTM A 325 or A 490 Bolts".

F. Welded Construction: Comply with AWS Code.

G. Holes for Other Work: Provide holes for securing other work and for passage of other work through steel as shown on final shop drawings.

1. Cut, drill or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.03 SHOP PAINTING

A. General: Shop paint except members or portions of members to be embedded in concrete. Paint embedded steel to be partially exposed on exposed portions and initial 2" of embedded areas only.

1. Do not paint surfaces to be welded or high-strength bolted with friction-type connections.
2. Apply 2 coats of paint to surfaces inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

B. Surface Preparation: After inspection and before shipping, clean steelwork to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows:

1. SP-1 "Solvent Cleaning".
2. SP-3 "Power Tool Cleaning".
3. SP-7 "Brush-off Blast Cleaning".

C. Painting: Immediately after surface preparation, apply primer in accordance with manufacturer's instructions to provide uniform dry film thickness of 1.5 mils. Use methods which result in full coverage.

D. Provide Architect with certification that specified requirements have been satisfied.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which the work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 ERECTION:

A. Surveys: Employ a registered professional engineer or land surveyor, for accurate erection of structural steel. Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection work proceeds. Do not proceed with erection until corrections have been made.

B. Temporary Shoring and Bracing: Provide temporary shoring and bracing of sufficient strength to bear imposed loads. Provide temporary guy lines to achieve proper alignment of structure as erection proceeds.

C. Temporary Planking: Provide temporary planking platforms necessary to complete work.

D. Anchor Bolts: Furnish anchor bolts and connectors required for securing structural steel to foundations.

1. Furnish templates necessary for presetting anchors.

E. Setting Bases and bearing Plates: Clean bearing surfaces of bond-reducing materials and roughen to improve bond. Clean bottom surfaces of base and bearing plates.

1. Set base and bearing plates on wedges or other adjusting devices.
2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims. If protruding, cut off flush with edge of plate.
3. Pack grout solidly between bearing surfaces. Finish exposed surfaces.

F. Field Assembly: Set structural frames accurately to lines and elevations indicated. Align and adjust members forming part of structure before permanently fastening. Clean surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb members within specified AISC tolerances.
2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature when completed.
3. Splice members only where accepted on shop drawings.

G. Erection Bolts: Remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.

H. Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

J. Do not enlarge holes in members by burning or by use of drift pins. Ream holes that must be enlarged to admit bolts.

K. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors.

L. Touch-Up Painting: After erection clean field welds, bolted connections and abraded areas. Apply primer paint to exposed areas to match shop coat.

3.03 QUALITY CONTROL:

A. Engage and independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports.

B. Provide access for testing agency to places where work is being fabricated so required inspection and testing can be accomplished.

C. Correct deficiencies in work which inspections and laboratory test reports indicate not in compliance with requirements. Perform additional tests, at Contractor's expense, to show compliance of corrected work.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1, General Requirements, apply to work of this section.

1.02 DECRIPTION OF WORK:

A. Extent of steel joists is shown on drawings, including basic layout and type of joists required.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. STRUCTURAL STEEL: Steel framing.

1.04 QUALITY ASSURANCE:

A. Provide joists fabricated in compliance with the following, and as herein specified.

1. Steel Joist Institute (SJI) Standard Specifications, Load Tables and Weight tables for:
   a. K-Series Open Web Steel Joists.

B. Qualification of Field Welding: Quality processes and operators in accordance with American Welding Society "Structural Welding Code", AWS D1.1.

C. Inspection: Inspect joists in accordance with SJI "Specifications".

1.05 SUBMITTALS:

A. Product Data: Specifications and installation instructions for each type of joist and accessories. Include manufacturer's certification that joists comply with SJI "Specifications".

B. Shop Drawings: Showing layout of joist units, special connections, jointing and accessories. Include mark, number, type, location and spacing of joists and bridging.

1. Provide templates or location drawings for installation of anchor bolts.

1.06 DELIVERY, STORAGE AND HANDLING:

A. Deliver, store and handle steel joists as recommended in SJI "Specifications"; in manner to avoid deforming members and excessive stresses.

PART 2 PRODUCTS

2.01 MATERIALS:

A. Steel: Comply with SJI "Specifications".

B. Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular hexagon type, low carbon steel.

C. Steel Prime Paint: Comply with SJI "Specifications".

2.02 FABRICATIONS:

A. General: Fabricate steel joists in accordance with SJI "Specifications".

B. Holes in Chord Members: Provide holes in chord members where shown for securing other work to steel joists; however, deduct area of holes from the area of chord when calculating strength of member.

C. Extended Ends: Provide extended ends on joists where shown, complying with manufacturer's standards and requirements of applicable SJI "Specifications" and load tables.

D. Ceiling Extensions: Provide ceiling extensions in areas having ceilings attached directly to joist bottom chord. Provide either on extended bottom chord element or a separate unit, to suit manufacturer's standards, of sufficient strength to support ceiling construction. Extend ends to within 1/2" of finished wall surface.

E. Bridging: Provide horizontal or diagonal type bridging for joists, complying with SJI "Specifications".

1. Provide bridging anchors for ends of bridging lines terminating at walls or beams.

F. End Anchorage: Provide end anchorages to secure joists to adjacent construction, complying with SJI "Specifications".

G. Header Units: Provide header units to support tail joists at openings in floor or roof system not framed with steel shapes.

H. Shop Paintings: Remove loose scale, heavy rust, and other foreign materials from joists and accessories before application of shop paint.

1. Apply one shop coat of primer paint to joists and accessories, by spray, dipping, or other method to provide continuous dry paint film thickness of 0.50 mil.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which steel joist work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 ERECTION:

A. Place and secure steel joists in accordance with SJI "Specifications", final shop drawings, and as herein specified.

B. Placing Joists: Do not start placement of joists until supporting work is in place and secured. Place on supporting work, adjust and align in accurate locations and spacing before permanently fastening.

1. Provide temporary bridging, connections, and anchors to ensure lateral stability during construction.
    a. Where joist lengths are 40 feet and longer, install a center row of bolted bridging to provide lateral stability before slackening of hoisting lines.

C. Bridging: Install bridging simultaneously with joist erection, berfore construction loads are applied. Anchor ends of bridging lines at top and bottom chords where terminating at walls or beams.

D. Fastening Joists:

1. Field weld joists to supporting steel framework or embedded bearing plates in accordance with SJI "Specifications" for type of joists used. Coordinate welding sequence and procedure with placing of joists.
2. Secure Joists resting on masonry or concrete bearing surfaces by bedding in mortar and anchoring to masonry or concrete construction as specified in SJI "Specifications" for type of steel joist used.
3. Bolt Joists to supporting steel framework in accordance with SJI "Specifications" for type of joists used. Provide unfinished threaded fasteners for bolted connections, unless otherwise indicated.

E. Touch-Up Painting: After joist installation, paint field bolt heads and nuts, and welded areas, abraded or rusty surfaces on joists and steel supporting members. Wire brush surfaces and solvent clean before painting. Use same type of paint as for shop painting.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1, General Requirements, apply to work of this section.

1.02 DECRIPTION OF WORK:

A. Extent of metal decking is indicated on drawings, including basic layout and type of deck units requried.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. STRUCTURAL STEEL: Steel framing.
B. STEEL JOISTS: Joist framing.

1.04 QUALITY ASSURANCE:

A. Codes and Standards: Comply with following codes and standards, except as otherwise indicated:

1. AISI "Specification for the Design of Cold-Formed Steel Structural Members".
2. AWS "Structural Welding Code".
3. SDI "Design Manual for Floor Decks and Roof Decks.

B. Qualification of Field Weldings: Qualify processes and operators in accordance with "Welder Qualification" procedures of AWS D.1.1

C. FM Listing: Provide roof deck units which have been evaluated by Factory Mutual System and are listed in :Factory Mutual Approval Guide" for "Class 1" fire rated construction.

1.05 SUBMITTALS:

A. Product Data: Specifications and installation instructions for each type of decking and accessories. Include manufacturer's certification to show compliance with these specifications.

B. Shop Drawings: Showing layout and types of deck panels, anchorage details, and conditions requiring closure panels, supplementary framing, cant strips, cut openings, special jointing or other accessories.

C. Insurance Certification: Assist Owner in preparation and submittal of roof installation acceptance certification in connection with fire and extended coverage insurance.

PART 2 PRODUCTS

2.01 MANUFACTURERS: Subject to compliance with requirements, provide products of one of the following:

A. Bowman/E.G. Smith, Div. Cyclops Corp.

B. United Steel Deck, Inc.
C. Wheeling Corrugating Co.

2.02 MATERIALS:

A. Steel for Galvanized Metal Deck Units: ASTM A 446, Grade A.

B. Miscellaneous Steel Shapes: ASTM A 36.

C. Sheet Metal Accessories: ASTM A 526, commercial quality, galvanized.

D. Galvanizing: ASTM A 525, G60.

E. Galvanizing Repair Paint: High zinc-dust content paint complying with Military Specifications MIL-P-21035 (Ships).

2.03 FABRICATION:

A. General: Form deck units in lengths to span 3 or more supports, with flush, telescoped or nested 2" laps at ends and interlocking or nested side laps.

B. Roof Deck Units: Provide configurations complying with SDI "Roof Deck Specifications", of metal thickness, depth and width as shown.

C. Floor Deck Units: Provide fluted sections of metal thickness, depth and width as shown.

D. Metal Cover Plates: Fabricate metal cover plates for end-abutting floor deck units of not less than same thickness as decking. Form to match contour of deck units and approximately 6" wide.

E. Metal Closure Strips: Fabricate metal closure strips, for openings between decking and other construction, of not less than 0.045" min. (18 gage) sheet steel. Form to provide tight-fitting closures at open ends of flutes and sides of decking.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which metal decking work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an accepted manner.

3.02 INSTALLATION:

A. General: Install deck units and accessories in accordance with manufacturer's recommendations, final shop drawings and as specified herein.

1. Place units on supporting steel and adjust to final position with ends accurately aligned and bearing on supporting members before being permanently fastened. Do not stretch or contract side lap interlocks.
2. Place units in straight alignment for entire length of run of

cells and with close alignment between cells at ends of abutting units.

3. Place units flat and square, secured to adjacent framing witout warp or excessive deflection.
4. Do not place units on concrete supporting structure until concrete has cured and is dry.
5. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
6. Do not use deck units for storage or working platforms until permanently secured.

B. Fastening Deck Units:

1. Fasten floor deck units to steel supporting members by not less than 3/4" diameter fusion welds or elongated welds of equal stength, spaced not more than 12" o.c. with a minimum of 2 welds per unit at each support.
   a. Use welding washers where recommended by manufacturer.
   b. Tack wled or use self-tapping No. 8 or larger machine screws at 4'-0" o.c. for fastening end closures.
2. Fasten roof deck units to steel supporting members by not less than 1/2" diameter fusion welds or elongated welds of equal strength, spaced not more than 12" o.c. at every support, and at closer spacing where requred for lateral force resistance. In addition, secure deck to each supporting members in ribs where side laps occur.
3. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work.
4. Mechanically fasten side laps of adjacent deck units between supports, at intervals not exceeding 36" o.c., using self-tapping No. 8 or larger machine screws.

C. Uplift Loading: Install and anchor roof deck units to resist gross uplift loading of 45 lbs. per sq. ft.at eave overhang and 30 lbs. per sq. ft. for other roof area.

D. Cutting and Fittings: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking, as shown.

E. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking and support of other work shown.

F. Joint Covers: Provide metal joint covers at abutting ends and changes in direction of floor deck units, except where taped joints are required.

G. Closure Strips: Provide metal closure strips at open uncovered ends and edges of roof decking, and in voids between decking and other construction. Weld into position to provide a complete decking installation.

G. Shear Connectors: Weld shear connectors to supports through decking units in accordance with manufacturer's instructions. Do not weld shear connectors through two layers (lapped ends) of decking units. Weld only on clean, dry deck surfaces.

H. Closure Strips: Provide metal closure strips at open uncovered ends and edges of roof decking, and in voids between decking and other construction. Weld into position to provide a complete decking installation.

J. Touch-Up Paintings: After decking installation, wire brush, clean and paint scarred areas, welds, rust spots on top and bottom surfaces of decking units. Touch up galvanized surfaces with galvanizing repair paint applied in accordance with manufacturer's instructions.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of cold-formed framing is shown on drawings.

B. Type of cold-formed metal framing units included: "C" Shaped load-bearing steel studs.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. METAL FABRICATIONS: Miscellaneous steel.
B. GYPSUM DRYWALL: Non-load bearing steel studs.

1.04 QUALITY ASSURANCE:

A. Component Design: Compute structural properties of studs and joists in accordance with American Iron and Steel Institute (AISI) "Specification for Design of Cold-Formed Steel Structural Members".

B. Welding: Use qualified welders and comply with American Welding Society (AWS) D1.3, "Structural Welding Code - Sheet Steel".

C. Fire-Rated Assemblies: Where framing units are components of assemblies indicated for a fire-resistance rating, including those required for compliance with governing regulations, provide units which have been approved by governing authorities having jurisdiction.

1.05 SUBMITTALS:

A. Product Data: Submit manufacturer's product information and installation instructions for each item of cold-formed framing and accessories.

B. Shop Drawings: Submit shop drawings for special components and installations not fully dimensioned or detailed in manufacturer's product data.

1. Include placing drawings for framing members showning size and gage designations, number, type, location and spacing. Indicate supplemental strapping, bracing, splices, bridging, accessories, and details required for proper installation.

1.06 DELIVERY AND STORAGE: Protect metal framing units from rusting and damage. Deliver to project site in manufacturer's unopened containers of bundles, fully identified with name, brand, type and grade. Store off ground in a dry ventilated space or protect with suitable waterproof coverings.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. Bostwick Steel Framing Co.
2. Milcor Division, Inryco Inc.
3. U.S. Gypsum
4. Wheeling Corrugating Co.

2.02 METAL FRAMING:

A. System Components: With each type of metal framing required, provide manufacturer's standard steel runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners, and accessories as recommended by manufacturer for applications indicated, as needed to provide a complete metal framing system.

B. Materials and Finishes:

1. For 16 gage and heavier units, fabricate metal framing components of structural quality steel sheet with a minimum yield point of 40,000 psi; ASTM A 446, A 570, or A 611.
2. For 18 gage and lighter units, fabricate metal framing components of commercial quality steel sheet with a minimum yield point of 33,000 psi; ASTM A 446, A 570, or A 611.

C. Provide galvanized finish to metal framing components complying with ASTM A 525 for minimum G 60 coating.

D. "C"-Shape Studs: Manufacturer's standard load-bearing steel studs of size, shape, and gage indicated, with 1.625" flange and flange return lip.

2.02 FABRICATION:

A. General: Framing components may be prefabricated into panels prior to erection. Fabricate panels plumb, square, true to line and braced against racking with joints welded. Perform lifting of prefabricated panels in a manner to prevent damage or distortion.

B. Fastenings: Attach similar components by welding. Attach dissimilar components by welding, bolting, or screw fasteners, as standard with manufacturer.

1. Wire tying of framing components is not permitted.

C. Fabrication Tolerances: Fabricate panels to maximum allowable tolerance variation from plumb, level and true to line of 1/8" in 10'-0".

PART 3 EXECUTION

3.01 INSPECTION AND PREPARATION:

A. Examine the areas and conditions under which lightage metal framing work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

B. Pre-Installation Conference: Prior to start of installation of metal framing system, meet at project site with installers of other work including door and window frames and mechanical and electrical work. Review areas of potential interference and conflicts, and coordinate layout and support provision for provisions for interfacing work.

3.02 INSTALLATION:

A. Manufacturer's Instruction: Install metal framing systems in accordance with manufacturer's printed or written instructions and recommendations, unless otherwise indicated.

B. Runner Tracks: Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks as recommended by stud manufacturer for type of construction involved, except do not exceed 24" o.c. spacing for nail or power-driven fasteners, or 16" o.c. for other types of attachment. Provide fasteners at corners and ends of tracks.

C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.

D. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure.

E. Install supplementary framing, blocking and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.

F. Installation of wall stud system: Secure studs to top and bottom runner tracks by either welding or screw fastening at both inside and outside flanges.

G. Frame wall openings larger than 2'-0" square with double stud at each jamb of frame except where more than 2 are either shown or indicated in manufacturer's instructions. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall. Secure stud system wall opening frame in manner indicated.

H. Frame both sides of expansion and control joints, with separate studs; and do not bridge the joint with components of stud system.

J. Install horizontal stiffeners in stud system, spaced (vertical distance) at not more than 4'-6" o.c Weld at each intersection.

K. Field Painting: Touch-up shop-applied protective coatings damaged during handling and installation. Use galvanizing repair paint for galvanized surfaces.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Definition: Metal fabrications include items made from shapes, plates, bars, strips, tubes, pipes and casting which are not a part of structural steel or other metal systems specified elsewhere.

B. Extent of metal fabrications is indicated on drawings and schedules.

C. Types of work in this section include metal fabrications for:

1. Rough hardware.
2. Loose bearing and leveling plates.
3. Loose steel lintels.
4. Miscellaneous framing and supports.
5. Steel railings.
6. Ladders.
7. Metal stairs.

1.03 Related work specified elsewhere:

A. STRUCTURAL STEEL: Steel framing.

1.04 SYSTEM PERFORMANCES:

A. Structural Performances: Provide assemblies which, when installed, comply with the following minimum requirements for structural performance, unless otherwise indicated.

1. Treads and Platforms of Steel Stairs: Capable of withstanding a uniform load of 100 lbf per sq. ft. or a concentrated load of 300 lbf so located as to produce maximum stress conditions.
2. Railings: Capable of withstanding the following loads applied as indicated when tested per ASTM E 935.
   a. Concentrated loads of 200 lbf applied at any point in any direction.
   b. Uniform load of 50 lbf per linear ft. applied simultaneously in both vertical and horizontal directions.
   c. Concentrated and uniform loads above need not be assumed to act concurrently.
3. Intermediate rails, balusters and panel fillers capable of withstanding load of 25 lbf per sq. ft. of gross area of guard, including any open areas, of which they are a part.
   a. Above load need not be assumed to be acting concurrently with uniform horizontal loads on toprails of railing assembly in determining stress on guard supporting members.

1.05 QUALITY ASSURANCE:

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.06 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.

B. Shop Drawings: Submit shop drawings for fabrication and erection of miscellaneous metal fabrications. Include plans, elevations and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor and bolt installation by others.

1. Where materials or fabrications are indicated to comply with certain requirements for design loadings, include structural computations, material properties and other information needed for structural analysis.

C. Samples: Submit 2 sets of representative samples of materials and finished products as may be requested by Architect.

PART 2 PRODUCTS

2.01 MATERIALS:

A. Ferrous Metals:

1. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
2. Steel Plates, Shapes and Bars: ASTM A 36.
3. Steel Tubing: Cold-formed, ASTM A 500; or hot-rolled, ASTM A 501.
4. Structural Steel sheet: Hot-rolled, ASTM A 570; or cold-rolled ASTM A 611, Class 1; of grade required for design loading.
5. Steel Pipe: ASTM A 53; Type and grade (if applicable) as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (schedule 40), unless otherwise indicated.
6. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.
7. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
8. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip

galvanized, ASTM A 153.

B. Non-Shrink Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CE CRD-C621. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

C. Fasteners: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.

1. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.
2. Lag Bolts: Square head type, FS FF-B-561.
3. Machine Screws: Cadmium plated steel, FS FF-S-92.
4. Wood Screws: Flat head carbon steel, FS FF-S-111.
5. Plain Washers: Round, carbon steel, FS FF-W-92.
6. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.
7. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.
8. Lock Washers: Helical spring type carbon steel, FS FF-W-84.

D. Shop Primer for Ferrous Metal: Manufacturer's or Fabricator's standard, fast-curing, lead-free, "universal" primer; selected for good resistance to normal atmospheric corrosion, for compatibility with finish paint systems indicated and for capability to provide a sound foundation for field-applied topcoats despite prolonged exposure; complying with performance requirements of FS TT-P-645.

2.02 FABRICATION, GENERAL

A. Workmanship: Use materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions indicated or accepted on shop drawings using proven details of fabrication and support. Use type of materials indicated or specified for various components of work.

1. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32" unless otherwise indicated. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
2. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.
3. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flathead (countersunk) screws or bolts.
4. Provide for anchorage of type indicated, corrdinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

5. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.

B. Galvanizing: Provide a zinc coating for those items indicated or specified to be galvanized, as follows:

1. ASTM A 153 for galvanizing iron and steel hardware.
2. ASTM A 123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strip 1/8" thick and heavier.
3. ASTM A 386 for galvanizing assembled steel products.
4. Within 6 hours of galvanizing apply a single part "universal" primer, compatible with finish paint coat specified in PAINTING SECTION.

C. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

D. Shop painting:

1. Apply shop primer to surfaces of metal fabrications except those which are galvanized or as indicated to be embedded in concrete unless otherwise indicated, and in compliance with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.
2. Stripe paint all edges, corners, crevices, bolts, welds and sharp edges.

E. Surface Preparation: Prepare ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications.

1. Exteriors (SSPC Zone AB): SSPC-SP6 "Commercial Blast Cleaning".
2. Interiors (SSPC Zone 1A: SSPC-SP3 "Power Tool Cleaning"

2.03 ROUGH HARDWARE:

A. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Carpentry.

B. Fabricate items to sizes, shapes and dimensions required. Furnish malleable-iron washers for heads and nuts which bear on wood structural connection; elsewhere, furnish steel washers.

2.04 LOOSE BEARING AND LEVELING PLATES:

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

2.05 LOOSE STEEL LINTELS:

A. Provide loose structural steel lintels for openings and recesses in masonry walls and partitions as indicated. Weld adjoining members together to form a single unit where indicated. Provide not less than 8" bearing at each side of openings, unless otherwise indicated.

1. Galvanize loose steel lintels to be installed in exterior walls.

2.06 MISCELLANEOUS FRAMING AND SUPPORTS:

A. Provide miscellaneous steel framing and supports which are not a part of structural steel framework, as required to complete work.

B. Fabricate miscellaneous units to sizes, shapes and profiles indicated or, if not indicated, of required dimensions to receive adjacent other work to be retained by framing. Except as otherwise indicated, fabricate from structural steel shapes and plates and steel bars, of welded construction using mitered joints for field connection. Cut, drill and tap units to receive hardware and similar items.

C. Equip units where indicated with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

1. Except as otherwise indicated, space anchors 24" o.c. and provide minimum anchor units of 1-1/4" x 1/4" x 8" steel straps.
2. Galvanize exterior miscellaneous frames and supports.

2.07 STEEL RAILING AND HANDRAILS:

A. Fabricate railing and handrails to design, dimensions, and detail indicated. Provide railings and handrails members formed of pipe, tube and bars of sizes and thickness indicated, but not less than that required to support design loading.

B. Interconnect railing and handrail members by butt-welding or with internal connectors, at fabricator's option, unless otherwise indicated.

1. At tee and cross intersections provide coped joints.
2. At bends interconnect pipe of tube by means of prefabricated elbow fittings or flush radius bends, as applicable, of radiuses indicated.
3. Form bends by use prefabricated elbow fittings and radius bends or by bending pipe or tube at fabricator's option.

C. Form simple and compound curves by bending in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section throughout entire bend without buckling, twisting or otherwise deforming exposed surfaces.

D. Provide wall returns at ends of wall-mounted handrails, except where otherwise indicated.

E. Close exposed ends of pipe or tube by welding 3/16" thick plate in place or by use of prefabricated fittings.

F. Toe Boards: Where indicated, provide toeboards at railings around openings and at the edge of open-sided floors and platforms. Fabricate to dimensions and details indicated, or if not indicated, use a 4" high x 1/8" plate welded to, and centered between, each railing post.

G. Brackets, Flanges, Fittings and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings and anchors for interconnection and attachment of railings and handrails to other work. Furnish inserts and other anchorage devices for connecting railings and handrails to concrete or masonry work.

1. For railing post set in concrete provide sleeves of galvanized steel not less than 6" long and with an inside dimension not less than 1/2" greater than the outside dimension of pipe or tube. Provide steel plate closure welded to bottom of sleeve and of width and length not less than 1" greater than outside dimension of sleeve.
2. Provide friction fit, removable covers designed to keep sleeves clean and hold top edge of sleeve 1/2" below finished-surface of concrete.

H. Galvanize exterior steel railings, including pipe, fittings, brackets, fasteners, and other ferrous components. Provide black steel pipe for interior railings.

2.08 LADDERS: Fabricate for locations shown, with dimensions, spacings, details and anchorages as indicated. Comply with requirements of ANSI A 14.3.

A. Unless otherwise shown, provide 1/2" x 2 1/2" continuous structural steel flat bar side rails with eased edges, spaced 18" apart.

B. Fit rungs in centerline of side rails, plub weld and grind smooth on outer rail faces.

C. Support ladder at top and bottom and at intermediate points spaced not more than 4'-0" o.c. Use welded or bolted steel brackets, designed for adequate support and anchorage, and to hold ladder clear of wall surface a minimum of 7" from wall to centerline of rungs. Extend rails 42" above top rung, and return rails to wall or structure unless other handholds are provided.

2.09 STEEL FRAMED STAIRS

A. General: Construct stairs to conform to sizes and arrangements indicated; join pieces together by welding unless otherwise indicated. Provide complete stair assemblies including metal framing, hangers, columns, railings, newels, baluster, struts, clips, brackets, bearing plates and other components necessary for the support of stairs and platforms and as required to anchor and contain the stairs on the supporting structure.

B. Stair Framing: Fabricate stringers of structural steel channels, or plates, or a combination thereof, as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to strings, newels and framing members to strings and headers; fabricate and join so that bolts, if used, do not appear on finish surfaces.

1. Where masonry walls support steel stairs, provide temporary supporting struts designed for erection of steel stair components before installation of masonry.

C. Metal Pan Risers, Subtreads, and Subplatforms: Shape metal pans for risers and subtreads to conform to configuration shown. Provide thicknesses of structural steel sheet for metal pans indicated but not less than that required to support total design loading.

1. Form metal pans of cold-rolled carbon steel sheet unless otherwise indicated.
2. Attach risers and subtreads to stringers by means of brackets made of steel angles or bars. Weld brackets to strings and attach metal pans to brackets by welding, riveting or bolting.
3. Provide subplatforms of configuration and construction indicated, or if not indicated, of same metal as risers and subtreads and in thicknesses required to support design loading. Attach subplatform to platform framing members with welds.

D. Stair Railings and Handrails: Comply with applicable requirements specified elsewhere in this section for steel pipe railings and handrails, and as follows:

1. Railings may be bent at corner, rail returns and wall returns, instead of using prefabricated fittings.
2. Connect railing posts to stair framing by direct welding, unless otherwise indicated.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which metal fabrications work is be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 PREPARATION:

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.

B. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to project site.

3.03 INSTALLATION:

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag-bolts, wood screws and other connectors as required.

B. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry or similar construction.

C. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

D. Field Welding: Comply with AWS code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

E. Setting Loose Plates: Clean concrete and masonry bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

1. Set loose leveling and bearing plates on wedges, or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut-off flush with the edge of the bearing plate before packing with grout. Use metallic non-shrink grout in concealed locations where not exposed to moisture; use non-metallic non-shrink grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

F. Pipe Railings and Handrails:

1. Adjust railing prior to anchoring to ensure matching alignment at abutting joints. Space post at spacing indicated, or if not

indicated, as required by design loadings. Plumb post in each direction. Secure posts and railing ends to building construction as follow:.
   a. Anchor post in concrete by means of sleeves preset and anchored into concrete. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with non-shrink, non-metallic grout, mixed and placed to comply with grout manufacturer's directions.
   b. Cover anchorage joint with a round flange welded to post.
2. Anchor posts to steel with oval flanges, angle type or floor type as required by conditions, welded to posts and bolted to steel supporting members.
3. Anchor rail ends into concrete and masonry with round flanges welded to rail ends and anchored into wall construction with lead expansion shield and bolts.
4. Anchor rail ends to steel with oval or round flanges welded to rail ends and bolted to structural steel members, unless otherwise indicated.
5. Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1-1/2" clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required for design loading. Secure wall brackets and wall return fittings to building construction as follows.
   a. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
   b. For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.
   c. For hollow masonry anchorage, use toggle bolts having square heads.
   d. For stud partitions use lag bolts set into wood backing between studs. Coordinate with stud installation for accurate location of backing members.
6. Expansion Joints: Provide expansion joints at locations indicated, or if not indicated, at intervals not to exceed 40 feet. Provide slip joint with internal sleeve extending 2" beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6" of posts.

3.04 ADJUST AND CLEAN:

A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting.

1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
2. For galvanized surfaces: Clean field welds, bolted connections and abraded areas and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION

PART I-GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division-I General Requirements, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Definition: Rough carpentry includes carpentry work not specified as part of other sections and which is generally not exposed, except as otherwise indicated.

B. Types of work in this section include rough carpentry for:

1. Wood framing.
2. Wood grounds, nailers, and blocking.
3. Wood furring.
4. Sheathing.
5. Subflooring.
6. Underlayment
7. Air infiltration barrier.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. FINISH CARPENTRY

1.04 SUBMITTALS:

A. Wood Treatment Data: Submit chemical treatment manufacturer's instructions for handling, storing, installation and finishing of treated material.

1. Preservative Treatment: For each type specified, include certification by treating plant stating type of preservative solution and pressure process used, net amount of preservative retained and conformance with applicable standards.
2. For water-borne treatment include statement that moisture content of treated materials was reduced to levels indicated prior to shipment to project site.
3. Fire-Retardant Treatment: Include certification by treating plant that treatment material complies with specified standard and other requirements.

1.05 PRODUCT HANDLING:

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar material.

1. For lumber and plywood pressure treated with waterborne chemicals, sticker between each course to provide air circulation.

1.06 PROJECT CONDITIONS:

A. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other work.

PART 2-PRODUCTS:

2.01 LUMBER, GENERAL:

A. Lumber Standards: Manufacture lumber to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.

B. Inspection Agencies: Inspection agencies and the abbreviations used to reference with lumber grades and species include the following:

1. RIS-Redwood Inspection Service.
2. NLGA-National Lumber Grades Authority.
3. SPIB-Southern Pine Inspection Bureau.
4. WCLIB-West Coast Lumber Inspection Bureau.
5. WWPA-Western Wood Products Association.

C. Grade Stamps: Factory-mark each piece of lumber with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber apply grade stamps to ends or back of each piece, or omit grade stamps entirely and issue certificate of grade compliance from inspection agency in lieu of grade stamp.

D. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.

1. Provide dressed lumber, S4S, unless otherwise indicated.
2. Proved seasoned lumber with 19% maximum moisture content at time of dressing and shipment for sizes 2" or less in nominal thickness, unless otherwise indicated.

2.02 DIMENSION LUMBER:

A. For light framing (2" to 4" thick, 2" to 4" wide), provide the following grade, any species:

1. Standard grade.
2. Any species grade under WWPA or WCLIB rules.

B. For structural light framing (2" to 4" thick, 2" to 4" wide), provide the following grade and species:

1. No. 2 grade.
2. Same species as indicated for structural framing grade below.

C. For structural framing (2" to 4" thick, 5" and wider), provide the following grade and species:

1. No. 2 grade unless otherwise indicated.
2. Southern Pine graded under SPIB rules.

2.03 BOARDS:

A. Concealed Boards: Where boards will be concealed by other work, provide lumber of 19% maximum moisture content (S-DRY) and of following species and grade:

1. Southern Pine No. 2 Boards per SPIB rules, or any species graded Construction Boards per WCLIB or WWPA rules.

B. Board Sizes: Provide sizes indicated or, if not indicated (for sheathing, subflooring and similar uses), provide 1" x 8" boards.

2.04 MISCELLANEOUS LUMBER:

A. Provide wood for support or attachment of other work including cant strips, bucks, nailers, blocking, furring, grounds, stripping and similar members. Provide lumber of sizes indicated, worked into shapes shown, and as follows:

1. Moisture content: 19% maximum for lumber items not specified to receive wood preservative treatment.
2. Grade: Standard Grade light framing size lumber of any species or board size lumber as required. No. 3 Common or Standard grade boards per WCLIB or WWPA rules or No.3 boards per SPIB rules.

2.05 CONSTRUCTION PANELS:

A. Construction Panel Standards: Comply with PS I "U.S. Product Standard for Construction and Industrial Plywood" for plywood panels and, for products not manufactured under PS I provisions, with American Plywood Association (APA) "Performance Standard and Policies for Structural-Use Panels", Form No.E445.

B. Trademark: Factory-mark each construction panel with APA trademark evidencing compliance with grade requirements.

C. Concealed APA Performance-Rated Panels: Where construction panels will be used for the following concealed types of applications, provide APA Performance-Rated Panels complying with requirements indicated for grade designation, span rating, exposure durability classification, edge detail (where applicable) and thickness.

1. Subflooring: APA RATED SHEATHING.
    a. Exposure Durability Classification: EXPOSURE 2.

   b. Span Rating: As required to suit joist spacing indicated.
2. Roof and Wall Sheathing: APA RATED SHEATHING.
   a. Exposure Durability Classification: EXPOSURE I.
   b. Span Rating: As required to suit rafter or stud spacing indicated.
3. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant treated plywood panels with grade designation, APA C-D PLUGGED INT with exterior glue, in thickness indicated, or, if not otherwise indicated, not less than 1/2".
4. Plywood Underlayment: APA UNDERLAYMENT INT. with exterior glue, fully sanded face; thickness indicated.

2.06 MISCELLANEOUS MATERIALS:

A. Fasteners and Anchorages: Provide size, type, material and finish as indicated and as recommended by applicable standards, complying with applicable Federal Specifications for nails, staples, screws, bolts, nuts, washers and anchoring devices. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommended nails.

   1. Where rough carpentry work is exposed to weather, in ground contact, or in areas of high relative humidity, provide fasteners and anchorages with a hot-dip zinc coating (ASTMA 153).

B. Air Infiltration Barrier: Provide 3.7 mil thick fabric composed of a layered and cross-oriented high density polyethylene which is microperforated for high moisture vapor transmission rate of 38.4 grams per 100 sq. in. in 24 hours; weight of 12.7 lbs. per 1000 sq. ft.

   1. Manufacturer: Subject to compliance with requirements, provide Parsec; Parsec, Inc.

C. Building Paper: ASTM D 226, Type I; asphalt saturated felt, non-perforated, 15 lb. type.

   1. Bituminous Mastic: FS TT-C-494.

2.07 WOOD TREATMENT BY PRESSURE PROCESS:

A. Preservative Treatment: Where lumber or plywood is indicated as "Treated", or is specified herein to be treated, comply with applicable requirements of AWPA Standards C2 (Lumber) and C9 (Plywood) and of AWPB Standards listed below. Mark each treated item with the AWPB Quality Mark Requirements.

   1. Pressure-treat above-ground items with water-borne preservatives to comply with AWPB LP-2. After treatment, kiln-dry lumber and plywood to a maximum moisture content, respectively, of 19% and 15%. Treat indicated items and the following:
      a. Wood cants, nailers, curbs, blocking, stripping, and similar

members in connection with roofing, flashing, vapor barriers and waterproofing.

b. Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.

2. Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment and to comply with AWPA M4. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

B. Fire-Retardant Treatment: Where fire-retardant treated wood is indicated, pressure impregnate lumber and plywood with fire-retardant chemicals to comply with AWPA C20 and C27, respectively, for treatment type indicated below; identify "FRTW" lumber with appropriate classification marking of Underwriters Laboratories, Inc., U.S. Testing, Timber Products Inspection or other testing and inspecting agency acceptable to authorities having jurisdiction.

1. Interior Type B.

C. Inspect each piece of treated lumber or plywood after drying and discard damaged or defective pieces.

PART 3-EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which rough carpentry work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 INSTALLATION, GENERAL:

A. Discard units of material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.

B. Set carpentry work to required levels and lines, with members plumb and true to line and cut and fitted.

C. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards. Countersink nail heads on exposed carpentry work and fill holes.

D. Countersink nail heads on exposed carpentry work and fill holes.

E. Use common wire nails, except as otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.

3.03 WOOD GROUNDS, NAILERS, BLOCKING AND SLEEPERS:

A. Provide wherever shown and where required for attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.

B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

3.04 WOOD FURRING:

A. Install plumb and level with closure strips at edges and openings. Shim with wood as required for tolerance of finished work.

B. Furring to Receive Gypsum Drywall: Unless otherwise indicated, provide 1" x 3" furring at 16" o.c., vertically.

C. Suspended Furring: Provide size and spacing indicated, including hangers and attachment devices. Level to a tolerance of 1/8" in 10'.

3.05 WOOD FRAMING, GENERAL:

A. Provide framing members of sizes and on spacings shown, and frame openings as shown, or if not shown, comply with recommendations of "Manual for House Framing" of National Forest Products Association (N.F.P.A.). Do not splice structural members between supports.

B. Anchor and nail as shown, and to comply with "Recommended Nailing Schedule" of "Manual for House Framing" and "National Design Specifications for Wood Construction published by N.F.P.A.

C. Firestop concealed spaces of wood framed walls and partitions at each floor level and at the ceiling line of the top story. Where firestops are not automatically provided by the framing system used, use closely-fitted wood blocks of nominal 2" thick lumber of the same width as framing members.

3.06 STUD FRAMING:

A. General: Provide stud framing where shown. Unless otherwise shown, use 2" x 4" wood studs spaced 16" o.c. with 4" face perpendicular to direction of wall or partition. Provide single bottom plate and double-top plates 2" thick by width of studs; except single top plate may be used for non-load-bearing partitions. Nail or anchor plates to supporting construction.

B. Construct corners and intersections with not less than 3 studs. Provide miscellaneous blocking and framing as shown and as required for support of facing materials, fixtures, specialty items and trim.

C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Set headers on edge and support on jamb studs.

  1. For non-bearing partitions, provide double-jamb studs and headers not less than 4" deep for openings 3' and less in width, and not less than 6" deep for wider openings.
  2. For load-bearing partitions, provide double-jamb studs for openings 6' and less in width, and triple-jamb studs for wider openings. Provide headers of depth shown, or if not shown, provide as recommended by N.F.P.A. "Manual for House Framing".

D. Provide diagonal bracing in stud framing of exterior walls. Brace both walls at each external corner, full story height, at a 45 degree angle, using either a let-in 1 x 4 or 2 x 4 blocking or metal diagonal bracing.

3.07 FLOOR JOIST FRAMING:

A. General: Provide framing of sizes and spacings shown. Install with crown edge up and support ends of each member with not less than 1-1/2" of bearing on wood or metal, or 3" on masonry. Attach to wood bearing members by toe nailing or metal connectors; frame to wood supporting members with wood ledgers as shown, or if not shown, with metal connectors. Fire-cut members built into masonry (if any). Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 4'. Do not notch in middle third of joists; limit notches to 1/6-depth of joist, 1/3 at ends. Do not bore holes larger than 1/3-depth of joist or locate closer than 2" from top or bottom. Provide solid blocking (2" thick by depth of joist) at ends of joists unless nailed to header or brand member.

B. Lap members framing from opposite sides of beams, girders or partitions not less than 4" or securely tie opposing members together. Provide solid blocking (2" thick by depth of joist) over supports.

C. Under jamb studs at openings, provide solid blocking between joists.

D. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.

  1. Provide triple-joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures, unless otherwise indicated.

E. Provide bridging between joists where nominal depth-to-thickness ratio exceeds 4, at intervals of 8'. Use metal bridging of 16 gage galvanized steel, sized for joist spacing indicated, double-crossed and nailed to both ends of joists.

3.08 RAFTER AND CEILING JOIST FRAMING:

A. Ceiling Joists: Provide member size and spacing shown, and as previously specified for floor joist framing. Face nail to ends of parallel rafters.

B. Provide special framing as shown for eaves, overhangs, dormers and similar conditions, if any.

3.09 INSTALLATION OF CONSTRUCTION PANELS:

A. General: Comply with applicable recommendations contained in Form No. E 30D, "APA Design/Construction Guide - Residential & Commercial," for types of construction panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Subflooring: Nail to framing.
2. Sheathing: Nail to framing. Clip to adjacent panels.
3. Underlayment: Nail to subflooring
4. Plywood Backing Panels: Nail or screw to supports.

3.10 AIR INFILTRATION BARRIER: Comply with manufacturer's printed instructions. Staple to exterior sheathing in horizontal sections, bottom to top, overlapping minimum 2 inches. Seal seams and edges with manufacturer's standard sealing tape.

3.11 BUILDING PAPER APPLICATION: Lay paper shingle fashion, starting at bottom of wall and lapping joints not less than 8". Seal vertical joints with mastic.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Definition: Finish carpentry includes carpentry work which is exposed to view, is non-structural, and which is not specified as part of other sections.

B. Types of finish carpentry work in this section include:

1. Exterior running and standing trim.
2. Interior running and standing trim.
3. Plywood soffits.
4. Handrails.
5. Stairs.
6. Door frames.
7. Railings.
8. Closet poles and shelving.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. ROUGH CARPENTRY
B. WOOD DOORS
C. SPECIAL DOORS
D. HARDWARE

1.04 QUALITY ASSURANCE:

A. Factory-mark each piece of lumber and plywood with type, grade, mill and grading agency identification; except omit marking from surfaces to receive transparent finish, and submit mill certificate that material has been inspected and graded in accordance with requirements if it cannot be marked on a concealed surface.

B. AWI Quality Standards: Comply with applicable requirements of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI).

1.05 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications and installation instructions for each factory fabricated item.

B. Samples: Submit the following samples for each species and cut or pattern of finish carpentry.

1. Exterior standing and running trim: 2'-0" long x full board or molding width, unfinished.
2. Interior standing and running trim: 2'-0" x full board or molding width, unfinished.

3. Handrail: 2'-0" long, unfinished.

1.06 PRODUCE DELIVERY, STORAGE AND HANDLING:

A. Protect finish carpentry materials during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver finish carpentry materials, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas. If, due to unforseen circumstances, finish carpentry materials must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

1.07 JOB CONDITIONS:

A. Conditioning: Installer shall advise Contractor of temperature and humidity requirements for finish carpentry installation areas. Do not install finish carpentry until required temperature and relative humidity have been stabilized and will be maintained in installation areas.

B. Maintain temperature and humidity in installation area as required to maintain moisture content of installed finish carpentry within a 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period. The fabricator of wood work shall determine optimum moisture content and required temperature and humidity conditions.

PART 2 - PRODUCTS

2.01 WOOD PRODUCT QUALITY STANDARDS:

A. Softwood Lumber Standards: Comply with PS 20 and with applicable grading rules of the respective grading and inspecting agency for the species and product indicated.

B. Plywood Standard: Comply with PS 1/ANSI A199.1.

C. Hardwood Lumber Standard: Comply with National Hardwood Lumber Association (NHLA) rules.

D. Woodworking Standard: Comply with specified provision of the Architectural Woodwork Institute (AWI) "Quality Standards".

1. Standing & Running Trim, & Rails: AWI Section 300.
2. Closet and Utility Shelving: AWI Section 600.
3. Miscellaneous Ornamental Items: AWI Section 700.
4. Stairwork and Handrails: AWI Section 800.
5. Door Frames: AWI Section 900.

E. Glued-up Lumber Standard: Comply with PS 56.

2.02 MATERIALS:

A. General:

1. Nominal sizes are indicated, except as shown by detailed dimensions. Provide dressed or worked and dressed lumber, as applicable, manufactured to the actual sizes as required by PS 20 or to actual sizes and pattern as shown, unless otherwise indicated.
2. Moisture Content of Softwood Lumber: Provide kiln-dried (KD) lumber having a moisture content form time of manufacture until time of installation not greater than values required by the applicable grading rules of the respective grading and inspecting agency for the species and product indicated.
3. Moisture Content of Hardwood Lumber: Provide kiln-dried (KD) lumber having a moisture content from time of manufacture until time of installation within the ranges required in the referenced woodworking standard.
4. Lumber of Transparent finish (Stained or Clear): Use pieces made of solid lumber stock.
5. Lumber for Painted Finish: At Contractor's option, use pieces which are either glued-up lumber or made of solid lumber stock.
6. For exterior finish carpentry work use glued-up lumber complying with PS 56 for "wet use" and certified so by respective grading and inspecting agency for species and product indicated.

B. Exterior Finish Carpentry:

1. Standing and Running Trim: For trim in form of boards and worked products, provide lumber complying with the following requirements including those of the grading agency listed with species.
    a. Species: Western Pine; WWPA or WCLIB.
    b. Grade: 2 Common.
    c. Texture: Surfaced (smooth).

2. Plywood: Any softwood species Exterior Type, Medium Density Overlay (MDO/EXT-APA), thickness indicated.

3. Railings: Prefabricated aluminum tube railing system with 3" square end posts and cast caps, white enamel finish; size and style as indicated.
    a. Manufactured by Sterling Factories, Inc. or approved equal.

C. Interior Finish Carpentry:

1. Standing and Running Trim for Painted Finish: Any Western softwood species graded and inspected by WWPA complying with following requirements:
    a. Grade for Standard Sizes and Patterns: "D Select".
2. Door Frames: Western Pine, complying with AWI standard indicated.
3. Handrails: Western Pine "C Select".
4. Window Stools: Hard Maple, First Grade.

5. Stairs: A/C INT APA plywood, any softwood species, thickness indicated.
6. Closet Poles and Shelves:
    a. Poles: Chrome plated steel pipe or tubing, 1-1/4" O.D. with chrome plated wrought steel flanges. Provide combination shelf and closet pole support, wrought steel with white enamel finish for spans greater than 36 inches.
    b. Shelves: Vinyl coated ventilated steel type, capable of supporting 75 lbs. p.s.f., maximum rod spacing 1", min. vinyl coating of 12-14 mils.

D. Miscellaneous Materials:

1. Fasteners and Anchorages: Provide nails, screws and other anchoring devices of the type, size, material and finish required for application indicated to provide secure attachment, concealed where possible, and complying with applicable Federal Specifications.
    a. Where finish carpentry is exposed on exterior or in areas of high relative humidity, provide fasteners and anchorages with a hot-dipped zinc coating (ASTMA 153).
2. Handrail Brackets: Polished cast aluminum for wall mounting as indicated.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which finish carpentry work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 PREPARATION:

A. Condition wood materials to average prevailing humidity conditions in installation areas prior to installing.

B. Pre-Installation Meeting: Meet at project site prior to delivery of finish carpentry materials and review coordination and environmental controls required for proper installation and ambient conditioning in areas to receive work. Include in meeting the Contractor, Architect and firms and persons responsible for continued operation (whether temporary or permanent) of HVAC system as required to maintain temperature and humidity conditions. Proceed with finish carpentry on interior only when everyone concerned agrees that required ambient conditions can be properly maintained.

3.03 INSTALLATION:

A. Discard units of material which are unsound, warped, bowed twisted, improperly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements, or which are of defective manufacturer with respect to surfaces, sizes or patterns.

B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level countertops; and with 1/16" maximum offset in flush adjoining 1/8" maximum offsets in revealed adjoining surfaces.

C. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.

D. Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners, to produce tight fitting joints with full surface contact throughout length of joint. Use scarf joints for end-to-end joints.

1. Make exterior joints water-resistant by careful fitting.
2. Apply flat grain lumber with bark side exposed to weather.

E. Anchor finish carpentry work to anchorage devices or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fasteners heads are required, use fine finishing nail for exposed nailings, countersunk and filled flush with finished surface, and matching final finish where transparent is indicated.

F. Standing and Running Trim & Rails: Comply with AWI Section 300 Custom Grade.

G. Door Frames: Comply with AWI Standard 900, Custom Grade.

H. Handrails: Comply with AWI Section 800, Custom Grade.

J. Shelving: Comply with Manufacturer's instructions.

3.04 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION:

A. Repair damaged and defective finish carpentry work wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork. Adjust joinery for uniform appearance.

B. Clean finish Carpentry work on exposed and semi-exposed surfaces.

C. Refer to Painting section for final finishing of installed finish carpentry work.

D. Protection: Protect and maintain conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of waterproofing work is indicated on drawings.

B. Types and application of work:

1. Hot applied asphalt waterproofing.

C. Provide waterproofing on exterior walls below grade, as indicated.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. JOINT SEALANTS

1.04 QUALITY ASSURANCE:

A. General: For each type of work, obtain primary materials from single manufacturer, to greatest extent possible. Provide secondary materials only as recommended by manufacturer of primary materials.

B. Installer Qualifications: A firm which has specialized for not less than three years in installation of types of waterproofing and dampproofing required for project and which is acceptable to manufacturer of primary materials.

1.05 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data, installation instructions, and recommendations for each material required. Include data substantiating that materials comply with requirements.

1.06 JOB CONDITIONS:

A. Substrate: Proceed with work only after substrate construction and penetrating work have been completed.

B. Weather: Proceed with work only when existing and forecasted weather conditions will permit work to be performed in accordance with manufacturer's recommendations.

C. Ventilation: Provide adequate ventilation to prevent accumulation of hazardous fumes during application of solvent-based components in enclosed spaces, and maintain ventilation until coatings have thoroughly cured.

PART 2 PRODUCTS:

2.01 MATERIALS:

A. General: Provide materials which comply with the following requirements, or provide other similar products which are certified in writing by manufacturer of primary materials to be superior in performance for application indicated.

B. Hot Rubberized Asphalt Waterproofing: Compound for thick-coat application, 150-mil minimum thickness for 40 to 120 degrees F. service temperature, 400 degrees F. pouring temperature, fast-setting, self-bonding to normal substrates, non-shrinking, thermosetting, 100 percent solids, intended for frost-free application temperatures as low as 0 degrees F. and tested by manufacturer for compliance with following requirements of cooled membrane.

1. Low Temp. Flexibility: No cracking, delaminating or loss of adhesion for 90 degree bend over 1/4" mandrel at -15 degrees F. in 1-sec. bend period.
2. Water Resistance: No blistering emulsification or deterioration for 24 hour immersion at 140 degrees F.; ASTM D 2939.
3. Water Vapor Permeability: 0.003 perms (max.) for 1/8" coating; ASTM E 96, Method E.
4. Water Absorption: 0.12% max. for 1/8" coating after 3-day immersion at 70 degrees F.; ASTM D 471.
5. Flash Point: 500 degrees F. min., (Cleveland open cup), ASTM D 92.
6. Manufacturer: Subject to compliance with requirements, provide waterproofing products of one of the following :
   a. Firestone WP System Membrane; Concrete Sealants, Inc.
   b. Tremproof 150; Tremco, Inc.

C. Miscellaneous Materials:

1. Plastic Cement: FS SS-C-153, asphalt base recommended by manufacturer of bituminous dampproofing materials.
2. Primer/Filler/Sealer: As recommended by manufacturer of waterproofing.
3. Flashing, Cant Strips and Accessories: As recommended by manufacturer of waterproofing.
4. Fiberboard Protection Course: Organic fiberboard, treated for resistance to fungus and insects, asphalt impregnated and coated on both faces; 1/2" thick.

PART 3 EXECUTION

3.01 INSPECTION: Examine substrate and conditions under which waterproofing and dampproofing work is to be performed. Do not proceed with work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 PREPARATION OF SUBSTRATE:

A. Clean substrate of projections and substances detrimental to work; comply with recommendations of prime materials manufacturers.

B. Fill voids and seal joints, as recommended by prime materials manufacturer, with particular attention at construction joints.

C. Prime substrate as recommended by prime materials manufacturer.

D. Protection of Other Work: Do not allow liquid and mastic compounds to enter and clog drains and conductors. Prevent spillage and migration onto other surfaces of work, by masking or otherwise protecting adjoining work.

3.03 INSTALLATION

A. General: Comply with manufacturer's instructions, except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of work.

B. Waterproofing Installation:

1. Apply uniform coating of waterproofing to substrate and adjoining surfaces indicated to receive membrane.
   a. Apply coating in compliance with manufacturer's recommendations.
   b. Provide 180-mil average (150-mil min.) coating.
2. Install sheet-type flashings and joint covers as recommended by manufacturer. Extend flashings onto perpendicular surfaces and other work penetrating substrate to not less than 4" beyond finished surface to be applied over waterproofing.
3. Permit membrane to cure under conditions which will not contaminate or deteriorate waterproofing material. Protect membrane from physical damage.
4. Protection Course: Install protection course on cured membrane without delay, so that membrane exposure will be minimized. Comply with waterproofing manufacturer's recommendations for adhesion of protection course to membrane.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division-1 General Requirements apply to the work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of thermal insulation work is shown on the drawings.

B. Applications of thermal insulation specified in this section include the following:

1. Rigid foundation insulation.
2. Blanket type insulation.
3. Board insulation.
4. Loose fill insulation.
5. Foamed insulation.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. FLEXIBLE SHEET ROOFING: Roof Insulation.
B. GYPSUM DRYWALL: Acoustical insulation; Metal furring.

1.04 QUALITY ASSURANCE:

A. Thermal Resistivity: Where thermal resistivity properties of insulation materials are designated by r-values they represent the rate of heat flow through a homogenous material exactly 1" thick, measured by test method included in referenced material standard or otherwise indicated. They are expressed by the temperature difference in degrees F. between the two exposed faces requried to cause one BTU to flow through one square foot per hour at mean temperatures indicated.

B. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics as listed for each material or assembly of which insulation is a part, have been determined by testing, per methods indicated below, by UL or other testing and inspecting agency acceptable to authorities having jurisdiction.

1. Surface Burning Characteristics: ASTM E 84.
2. Fire Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

1.05 SUBMITTALS: Submit manufacturer's specifications and installation instructions for each type of insulation required.

A. Certified Tests: With product data, submit copies of certified test report showing compliance with specified performance values, including k-values (aged values for plastic insulation), densities, compression strengths, burning characteristics, perm ratings, water absorption ratings and similar ratings.

1.06 PRODUCT HANDLING:

A. Do not allow insulation materials to become wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

B. Protection for Plastic Insulation:

1. Do not expose to sunlight, except during period of installation.
2. Protect against ignition at all times. Do not deliver plastic insulating materials to project site ahead of installation time.
3. Complete installation and concelament of plastic materials as rapidly as possible.

PART 2 PRODUCTS

2.01 MATERIALS:

A. Rigid Foundation Insulation: Rigid, cellular thermal insulation with closed-cells and integral high density skin, formed by expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578 for type indicated; with 5 year aged values of 5.4 and 5 at 40 degrees and 70 degrees F. respectively.

1. Type IV 1.6 lb./cu. ft. minimum density.
2. Where exposed above grade, provide insulation with manufacturer's standard cementitious hard coat finish reinforced with fiberglass mesh on exterior face.
3. Manufacturer: Subject to compliance with requirements provide product of one of the following:
   a. Dow Chemical Co.
   b. UC Industries/U.S. Gypsum Co.

B. Unfaced Mineral Fiber Blanket/Batt Insulation: Thermal insulation produced by combining mineral fibers of glass or slag with thermosetting resins to comply with ASTM C 665 for Type 1 (blankets without membrane facing); and as follows:

1. Combustion Characteristics: Passes ASTM E 136 test.
2. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively.
3. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
   a. Certain-Teed Products Corp.
   b. Manviller Building materials Corp.
   c. Owens-Corning Fiberglass Corp.

C. Loose Mineral Fiber Insulation: Glass fibers processed to comply with ASTM C 764, passing ASTM E 136 for combustion characteristics; maximum flame spread and smoke developed of 5 and 5 respectively; for loose application.

1. Manufacturer: Same as required for blanket/batt insulation.

D. Foamed Insulation: One component expandable urethane froth foam, self-propelled, self-adhesive, self-expanding and curing; designed for filling cracks and voids in framing.

E. Board Insulation: Rigid, cellular thermal insulation with glass-fiber reinforced polyiscocyanurate closed-cell foam core with aluminum foil facing laminated to both sides; complying with FS HH-1-1972/1, class 2; aged r-values of 7.2 and 8 at 40 and 75 degrees F. resspecitvely and as follows:

1. Surface Burning Characteristics: Maximum values for flame spread and smoke developed of 20 and 50, respectively.
2. Manufacturers: Subject to compliance with requirements, provide products of one of the following:
   a. Celotex Corp.
   b. Manville Corp.

PART 3 EXECUTION

3.01 INSPECTION AND PREPARATION:

A. Examine substrates and conditions under which insulation work is to be performed. Do not proceed with work until unsatisfactory conditions have been corrected in an acceptable manner.

B. Clean substrates of substances harmful to insulations, including removal of projections.

3.02 INSTALLATION

A. General:

1. Comply with manufacturer's instructions for the particular conditions of installation in each case. If printed instructions are not available or do not apply to the project conditions, consult the manufacturer's technical representative for specific recommendations before proceeding with the work.
2. Extend insulation full thickness as shown over entire area to be insulated.

B. Perimeter Insulation: On vertical surfaces, set units in adhesive applied in accordance with manufacturer's instructions.

C. General Building Insulation:

1. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations.
2. Set vapor retarder units with vapor retarder to warm side of construction. Do not obstruct ventilation spaces except for firestopping.
3. Stuff loose mineral fiber insulation into miscellaneous voids and cavity spaces. Compact to approximately 40% of normal

maximum volume (to a density approximately 2.5 lbs. per cu. ft.).

D. Foam Insulation: Foam material into perimeter spaces between structure and door and window penetrations.

3.03 PROTECTION: Protect installed insulation from harmful weather exposures and from possible physical abuses where possible by nondelayed installation of concealing work or, where that is not possible, by temporary covering or enclosure.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements apply to work of this section.

1.02 DESCRIPTION OR WORK:

A. Extent of flexible sheet roofing is indicted on drawings and is hereby defined to include non-traffic-bearing sheet membrane system intended for weather exposure as primary roofing.

B. Type of flexible sheet roofing specified in this section is:

1. Totally adhered.

C. Roof insulation related to flexible sheet roofing is specified in this section.

D. Removal of existing roofing, insulation, gravel stops and flashing is included as work of this section.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. ROOF ACCESSORIES: Metal roofing, gutters and hatches.

B. MECHANICAL DIVISION: Roof drains, vents and exhaust fans.

1.04 QUALITY ASSURANCE:

A. Manufacturer: Obtain primary flexible sheet roofing from a single manufacturer. Provide secondary materials as recommended by manufacturer of primary materials.

1. Manufacturer shall send qualified technical representative to project site for purposes of advising installer of procedures and precautions for use of roofing materials.

B. Installer: A firm with not less than 3 years of successful experience in installation of roofing systems similar to those required for this project and which is acceptable to or licensed by manufacturer of primary roofing materials.

1. Assign work closely associated with flexible sheet roofing, including (but not limited to) insulation, flashing and counterflashing, expansion joints, and joint sealers, to Installer of flexible sheet roofing.

C. Pre-Roofing Conference: Prior to installation of roofing and associated work, meet at project site with Installer, roofing manufacturer, installers of related work, and other entities concerned with roofing performance, including (where applicable) Owner's insurer, test agencies, governing authorities, Architect, and Owner. Record discussions and agreements and furnish copy to each participant. Provide at least 72 hours advanced notice to participants prior to convening pre-roofing conference.

D. Insurance Certification: Assist Owner in preparation and submittal of roof installation acceptance certification necessary in connection with fire and extended coverage insurance on roofing and associated work.

E. UL Listing: Provide "Class A" labeled materials which have been tested and listed by UL for application indicated and for roof slopes shown.

F. Fire Performance Characteristics: Provide insulation materials with fire performance identical to those listed, determined by testing methods indicated and by UL or other testing agency acceptable to governing authorities.

1.05 SUBMITTALS:

A. Product Data: Submit specifications, installation instructions and general recommendations from manufacturers of flexible sheet roofing system materials, for tyeps of roofing required. Include data substantiating that materials comply with requriements.

B. Samples: Submit 12" square samples of finished roofing sheets, including "T-shaped" side/end-lap seam; 12" square samples of required insulation.

C. Shop Drawings: Submit complete shop drawings showing roof configuration and sheet layout, details at perimeter, and special conditions.

D. Pre-Roofing Conference: Submit copies of pre-roofing conference records.

1.06 JOB CONDITIONS: Proceed with roofing work when existing and forecasted weather conditions permit work to be performed in accordance with manufacturer's recommendations and warranty requirements.

1.07 SPECIAL PROJECT WARRANTY: Provide written warranty, signed by Manufacturer of primary roofing materials and his authorized installer, agreeing to replace/repair defective materials and workmanship. Warranty period is 10 years after date of substantial completion.

PART 2 PRODUCTS

2.01 GENERAL:

A. Performance: Provide roofing materials recognized to be of generic type indicated and tested to show compliance with indicated performances.

B. Compatibility: Provide products which are recommended by manufacturers to be fully compatible with indicated substrates, or provide separation materials as required to eliminate contact between incompatible materials.

2.02 ADHERED SYSTEM:

A. EPDM Membrane: Ethylene propylene diene monomers formed into uniform flexible sheets, complying with ASTM D 4637, Type 1; Glass L1 or SR as standard with manufacturer.

1. Thickness: 60 mils, nominal.
2. Exposed Face Color: Manufacturer's standard.
3. UL Firerated.

B. Manufacturers: subject to compliance with requirements, provide one of the following:

1. Carlise Syntec Systems.
2. Goodyear Tire and Rubber Co.
3. Syenergy Methods, Inc.

2.03 AUXILIARY MATERIALS:

A. Sheet Seaming System: Manufacturer;s standard materials for sealing lapped joints, including edge sealer to cover exposed spliced edges as recommended by manufacturer of FSR system.

B. Cant Strips, Gravel Stops and Flashing Accessories: Types recommended by manufacturer of flexible sheet roofing material, provided at locations indicated and at locations recommended by mfr., and including adhesive tapes, flashing cements, and sealants.

1. Where indicated or required provide expansion joint covers which are part of flexible sheet roofing system.

C. Slip Sheet: Type recommended by manufacturer of FSR material for protection of sheet from incompatible substrates.

D. Flashing Material: Manufacturer's standard system compatible with flexible sheet membrane.

E. Mechanical Fasteners: Metal plates, caps, battens, accessory components, fastening devices and adhesives to suit substrates and as recommended by sheet roofing manufacturer.

F. Membrane Adhesive: As recommended by sheet roofing membrane manufacturer for particular substrate and project conditions, formulated to withstand minimum 60 psf uplift force.

2.04 INSULATION:

A. General: Thicknesses shown are for thermal conductivity (k-value at 75 degrees F) specified for each material; provide appropriate thickness of material when thermal resistance ("R" values) are shown.

B. Polyisocyanurate Insulation: Rigid, cellular thermal insulation with polyisocyanurate closed-cell foam core and manufacturer's facing approved by sheet roofing manufacturer for adhered membrane application, complying with FS HH-I-1972/2, Class 1, aged R-values as designated at mean temperatures indicated after conditioning per RIC/TIMA Bulletin #281-1; and as follows:

1. Surface Burning Characteristics: Maximum flame spread of 25.
2. Thermal Resistivity: 14.4 at 75 degrees F. for 2" thick board.
3. Tapered where indicated.

2.05 AUXILIARY INSULATION MATERIALS:

A. Mechanical Anchors: As recommended by insulation manufacturer for deck type, and complying with fire and insurance rating requirements.

2.06 ROOFING ACCESSORIES:

A. Walkway Pads: Sheet roofing manufacturer's standard rubber walkway pads for high traffic areas, standard size and color.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which flexible sheet roofing work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 PREPARATION OF SUBSTRATE:

A. Remove existing roofing insulation, gravel stops and flashing to expose clean roof deck. Comply with requirements of SELECTIVE DEMOLITION SECTION. Provide temporary protective covering of deck surface until permanent roofing is installed.

B. General: Comply with manufacturer's instructions for preparation of substrate to receive flexible sheet roofing system.

C. Clean substrate of dust, debris, and other substances detrimental to flexible sheet roofing system work. Remove sharp projections

D. Install cant strips, flashing, gravel stops and accessory items as shown, and as recommended by manufacturer even though not shown.

E. Prevent compounds from entering and clogging drains and conductors, and from spilling or migrating onto surfaces of other work.

3.03 INSTALLATION:

A. General: Comply with manufacturer's instructions, except where more stringent requirements are indicated.

B. Insulation Installation:

1. General: Extend insulation fill thickness as a single layer over entire surface to be insulated, cutting and fitting tightly around obstructions. Form cant strips, crickets, saddles, and tapered areas with additional material as shown and as required for proper drainage of membrane.
    a. Stagger joints in one direction for each course. For multiple layers, stagger joints both directions between courses.
2. Do not install more insulation each day than can be covered with membrane before end of day and before start of inclement weather.
3. Secure roof insulation to substrate with mechanical anchors as recommended by insulation manufacturer; But in no case less than the anchorage required by FM "Loss Prevention Data Sheet 1-28".

C. Flexible Sheet Roofing:

1. General: Start installation only in presence of manufacturer's technical representative.
2. Cut sheets to maximum size possible, in order to minimize seams and to accommodate contours of roof deck and proper drainage across shingled laps of sheets.
3. Adhesive-Adhered Membrane: Install membrane by unrolling over prepared substrate, lapping adjoining sheets as recommended by manufacturer. Apply adhesive to surfaces to be bonded and roll sheet roofing membrane into place when adhesive has properly cured. Treat seams with special cement and apply sealant to exposed sheet edges, tapering application as recommended by manufacturer. Install mechanical fasteners, flashing and counterflashings and accessories at locations indicated and as recommended by sheet roofing manufacturer.
4. Walkways Pads: Install at locations shown and where required for access to roof-mounted equipment. Place carefully to avoid damage to membrane.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements apply to the work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of each type of flashing and sheet metal work is indicated on drawings and by provisions of this section.

B. Types of work specified in this section include the following:

1. Metal flashing.
2. Metal copings.
3. Metal bay panels.
4. Metal bay roofing.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. SHINGLES: Flashing for asphalt shingles.
B. FLEXIBLE SHEET ROOFING: Roof membrane flashing.
C. ROOF ACCESSORIES: Integral flashings.

1.04 QUALITY ASSURANCE: The work is to be performed by a single firm specializing in the type of work required, so that there is undivided responsibility for the performance of the work.

1.05 SUBMITTALS:

A. Product Data: Submit manufacturer's product data, installation instructions and general recommendations for each specified sheet material and fabricated product.

B. Samples: Submit 8" square samples of specified sheet materials to be exposed as finished surfaces.

1. Submit 12" long, completely finished units of specified factory-fabricated products exposed as finished work.

C. Shop Drawings: Submit shop drawings showing layout, joining, profiles, and anchorages of fabricated work, including metal coping, panel and roofing layout at 1/4" scale, details at 3" scale.

1.06 JOB CONDITIONS: Coordinate work of this sectin with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.

PART 2 PRODUCTS

2.01 FLASHING AND SHEET METAL MATERIALS:

A. Sheet Metal Flashing/Trim: Aluminum, ASTM B 209, alloy 3003, temper

H14; 0.050" thick (18 Gage) unless otherwise indicated; pre-painted baked enamel acrylic coating in color selected by Architect from manufacturer's standards.

B. Miscellaneous Materials and Accessories:

1. Fasteners: Same metal as flashing/sheet metal or, other noncorrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.
2. Bituminous Coating: FS TT-C-494 or SSPC - Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
3. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
4. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed; comply with FS TT-S-00227, TT-S-00230, or TT-S-001543.
5. Metal Accessories: Provide sheet metal clips, straps, anchoring devices and similar accessory units as required for installation of work, matching or compatible with material being installed, noncorrosive, size and gage required for performance.

2.02 FABRICATED UNITS:

A. General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration to the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

1. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
2. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

B. Metal Copings:

1. Manufacturer's standard system consisting of coping formed from aluminum sheet to profile and thickness indicated, zinc coated steel anchor plate or cleat loacted at coping joint, and formed aluminum gutter chair or gutter/splice plate; without exposed fasteners.
    a. Aluminum: ASTM B 204, alloy 5005, temper H 15; manufacturer's baked enamel finish in color selected by

Architect from manufacturers standards.
   b. Thickness: .063 inches.
   c. Size: As indicated.
2. Metal Bay Roofing: Manufacturer's preformed aluminum roofing, fabricated to profiles and dimensions indicated; without exposed surface fasteners.
   a. Thickness: .063 inches.
   b. Finish: Baked enamel in color selected by Architect.
3. Metal Bay Wall Panels: Manufacturer's preformed aluminum wall panels, fabricated to profiles and dimensions indicated; no exposed surface fasteners.
   a. Thickness: 0.50 inches.
   b. Finish: Baked enamel in color selected by Architect.
4. Manufacturer: Subject to compliance with requirements, provide one of the following:
   a. Construction Specialties Inc.
   b. W.P. Hickman Co.
   c. Merchant & Evans Industries Inc.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which flashing and sheet metal work are to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 INSTALLATION REQUIREMENTS:

A. General: Except as otherwise indicted, comply with manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual". Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps joints and seams which will be permanently watertight and weatherproof.

B. For non-moving seams provide soldered flat-lack seams. Comply with metal producer's recommendations for sealing joints.

C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than 1" deep, filled with mastic selant concealed within joints.

D. Sealant Joints: Where movable non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with industry standards.

E. Provide for thermal expansion of all exposed sheet metal work exceeding 15 feet in running length.

F. Conceal Fasteners and expansion provisions wherever possible. Fold back edges on concealed side of exposed edges to form a hem.

G. Install shop-fabricated metal coping assemblies in strict accordance with manufacturer's instructions.

1. Provide joint assemblies and sealants standard with manufacturer's system of installation.

3.03 CLEANING AND PROTECTION:

A. Clean exposed metal surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.

B. Protecting: Protect flashing and sheet metal work during construction, to ensure that work will be without damage or deterioration, other than natural weathering, at time of substantial.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of this Contract and Division 1 General Requirements, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent and locations of roof accessories is indicated on the drawings and by provisions of this section.

B. Type of units specified in this section:

1. Roof hatches.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. FLEXIBLE SHEET ROOFING: Roof flashing.
B. MECHANICAL DIVISION.: Roof drains and vents.

1.04 QUALITY ASSURANCE:

A. Standards: Comply with SMACNA "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and capflashing to coordinate with type of roofing indicated. Comply with "NRCA Roofing and Waterproofing Manual" details for installation of units.

1.05 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data, rough-in diagrams, details, structural certifications, installation instructions and general product recommendations.

B. Samples: Submit 2 samples, min. 8" square, of each exposed metal and 2 samples min. 24" long, of formed or extruded exposed metal members; color and finish as specified.

PART 2 PRODUCTS

2.01 GENERAL PRODUCT REQUIREMENTS:

A. Provide manufacturers' standard units, modified as necessary to comply with requirements. Shop fabricate each unit to greatest extent possible.

2.02 MATERIALS, GENERAL:

A. Aluminum Sheet: ASTM B 209, alloy 3003, temper as required for forming and performance; AA-C22A41 clear anodized finish, except as otherwise indicated.

B. Extruded Aluminum: Manufacturer's standard extrusions of sizes and general profiles indicated, alloy 6063-T52; 0.078" minimum thicknesses for primary framing and curb member legs, 0.062" for secondary legs; AA-C22A41 clear anodized finish on exposed members, except as otherwise indicated.

C. Insulation: Manufacturer;s standard rigid or semi-rigid board of glass fiber of thicknesses indicated.

D. Wood nailers: Softwood lumber, pressure treated with water-borne preservatives for above-ground use, complying with AWPB LP-2; not less than 1-1/2" thick.

E. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by manufacturer. Match finish of exposed fasteners with finish of material being fastened.

1. Where removal of exterior exposed fasteners affords access to building, provide nonremovable fastener heads.

F. Gaskets: Tubular or fingered design of neoprene or polyvinyl chloride, or block design of sponge neoprene.

G. Bituminous Coating: FS TT-C-494 or SSPC-Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coating.

H. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

J. Elastomeric Sealant: Generic type recommended by unit manufacturer, which is compatible with joint surfaces; comply with FS TT-S-0027, TT-S-00230, or TT-S-001543.

2.03 UNIT MATERIALS, FABRICATION:

A. Roof Hatches: Fabricate units of sizes shown, single or double leaf as indicated, for 40 lbs. per sq. ft. external loading and 20 lbs. per sq. ft. interior loading pressure. Frame with integral curb double-wall construction with 1-1/2" insulation, cant strips and cap flashing, with welded or sealed mechanical corner joints. Provide double-wall cover construction with 1" insulation core. Equip units with complete hardware set including hold-open devices, interior padlock hasps and both interior and exterior latch handles. Provide gasketing. Fabricate of aluminum sheets and extrusions.

1. Where slope of roof deck exceeds 1/4" per ft., fabricate curbs with height tapered to match slope, to result in level installation of tops of units.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which roof accessory work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 INSTALLATION:

A. General: Comply with manufacturer's instructions and recommendations. Coordinate with installation of roof deck and other substrate to receive accessory units, and with roof insulation, roofing and flashing; as required to ensure that each element of the work performs properly, and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.

1. Install roof accessory items in accordance with construction details of "NRCA Roofing and Waterproofing Manual".

B. Isolation: Where metal surfaces of units are to be installed in contact with noncompatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation.

C. Flange Seals: Except as otherwise indicated, set flanges of accessory units in a thick bed of sealant to form a seal.

D. Cap Flashing: Where cap flashing is required as components of accessory, install to provide adequate waterproof overlap with roofing or roof flashing (as counter flashing). Seal with thick bead of mastic sealants, except where overlap is indicated to be left open for ventilation.

E. Operational Units: Test operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

3.03 CLEANING AND PROTECTION: Clean exposed metal and plastic surfaces in accordance with manufacturers instructions. Touch up damaged metal coatings.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements apply to the work of this Section.

1.02 DESCRIPTION OF WORK:

A. extent of each form and type of joint sealer is indicated on the drawings, and by provisions of this section.

B. Applications for joint sealers include, but are not necessarily limited to, the following general locations:

1. Concrete joints.
2. Exterior wall joints.
3. Interior wall joints.
4. Fire stopping sealants.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. GLASS AND GLAZING: Glazing sealants.
B. GYPSUM DRYWALL: Acoustical sealant.
C. TILE: Sealant for tile joints.

1.04 QUALITY ASSURANCE:

A. Manufacturers: Firms with not less than 5 years of successful experience in production of types of sealants and caulking compounds required for this project.

1. Obtain elastomeric sealants from a manufacturer which will, upon request, send a qualified technical representative to project site, for purpose of advising installer on proper procedures for use of products.

B. Installer: A firm with a minimum of 5 years of successful experience in application of types of materials required.

1.05 SUBMITTALS

A. Product Data: Submit manufacturer's product specifications, handling/installation/curing instructions, and performance tested data sheets for each product required.

1. Certified Tests: With product data submit certified test reports for elastomeric sealants on aged performances including hardness, stain resistance, adhesion, cohesion or tensile strength, elongation, low-temperature flexibility, compression set, modulus of elasticity, water absorption, and resistance (aging, weight loss, deterioration) to heat and exposures to ozone and ultraviolet.

B. Samples: Submit 3, 12" long samples of each color required (except black) for each type of sealant and caulking compound exposed to view. Install sample between 2 strips of material similar to or representative of typical surfaces where compound will be used, held apart to represent typical joint widths.

1.06 JOB CONDITIONS:

A. Pre-Installation Meeting: At Contractor's direction, Installer, sealant manufacturer's technical representative, and other trades involved in coordination with sealant work shall meet with Contractor at project site to review procedures and time schedule proposed for installation of sealants in coordination with other work. Review each major sealant application required on project.

B. Condition of Other Work: The Installer must examine joint surfaces, backing, and anchorage of units forming sealant rabbet, and conditions under which sealant work is to be performed, and notify Contractor in writing of conditions detrimental to proper completion of the work and performance by sealants. Do not proceed with sealant work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

C. Weather Conditions: Do not proceed with installation of sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended temperature range for installation. Proceed with the work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength. Where joint width is affected by ambient temperature variations, install elastomeric sealants only when temperatures are in lower third of the manufacturer's recommended installation temperature range, so that sealant will not be subjected to excessive elongation and bond stress at subsequent low temperatures. Coordinate time schedule with Contractor to avoid delay of project.

1.07 SPECIAL PROJECT WARRANTY (GUARANTEE):

A. Sealant Warranty: Provide written warranty, signed by Contractor and Installer; agreeing to, within warranty period, replace/repair defective materials and workmanship defined to include: instances of significant leakage of water or air; failures in joint adhesion, material cohesion, abrasion resistance, weather resistance, extrusion-from-joint resistance, migration resistance, strain and the general appearance of deterioration in any other manner not clearly specified in manufacturer's published product literature as an inherent characteristic of the sealant material. Warranty includes responsibility for removal and replacement of other work (if any) which conceals or obstructs the replacement of sealants. Warranty covers the following types of sealants on this project, for the following periods of time:

1. Elastomeric sealants.
2. Warranty period is 3 years after date of substantial completion.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL:

A. Colors: Provide black or other natural color where no other standard or custom color is available. Where material is not exposed to view, provide manufacturer's standard color which has best overall performance characteristics for application shown.

1. Provide exposed to view colors as selected by Architect from manufacturer's standards.

B. Hardness shown and specified are intended to indicate general range necessary for overall performance. Consult manufacturer's technical representative to determine actual hardness recommended for conditions of installation and use. Upon request Architect will furnish information concerning anticipated joint movement related to actual joint width and installation temperature. Except as otherwise indicated or recommended, provide compounds within the following ranges of hardness (Shore A, fully cured, at 75 degrees F.)

1. 5 to 20 for high percentage of movement and minimum exposure to weather and abrasion (including no exposure to vandalism).
2. 15 to 35 for moderate percentage of movement and moderate exposure to weather and abrasion.
3. 30 to 60 for low percentage of movement and maximum exposure to weather and abrasion (including foot traffic on horizontal joints).

C. Modulus of Elasticity: For joints subject to movement, either thermal expansion or dynamic movement, select sealants from among available variations which have lowest modulus of elasticity which is consistent with exposure to abrasion or vandalism. For horizontal joints subject to traffic, select sealants with high modulus of elasticity as required to withstand indentation by stiletto heels. Comply with manufacturer's recommendations where no other requirements are indicated.

D. Compatibility: Before selection and purchase of each specified sealant, investigate its compatibility with joint system. Provide only materials (manufacturer's recommended variation of specified materials) which are known to be fully compatible with actual installation conditions, as shown by manufacturer's published data or certification.

2.02 ELASTOMERIC SEALANTS:

A. Two-Component Polyurethane Sealant (Control Joints):

1. Polyurethane-based, 2-part elastomeric sealant, complying with FS TT-S-00227, Class A, Type 1 (self-leveling) or Type 2 (non-sag) as recommended by manufacturer for application shown.

2. Products offered by manufacturers to comply with the requirements include the following:
   a. Dynatrol II, Urexpan; Pecora Corp.
   b. Chem-Calk 550; Woodmont Products, Inc.
3. Optional Sealant: At Contractor's option, provide "Dymeric" sealant by Tremco Mfg. Co. (3-component epoxidized urethane complying with FF TT-S-00227), in lieu of 2-component polyurethane sealant.
   a. Primer recommended by sealant manufacturer.

2.03 NON-ELASTOMERIC SEALANTS:

A. One-Component Acrylic Sealant (GENERAL EXTERIOR JOINTS):

1. Acrylic terpolymer, solvent-based, one part, thermo-plastic sealant compound; solids not less than 95% acrylic; complying with FS TT-S-00230, Class B, Type
2. Products offered by manufacturers to comply with requirements include the following:
   a. DAP One-Part Acrylic; DAP, Inc.
   b. 60 - Unicrylic; Pecora Corp.
   c. Mono; Tremco, Inc.

B. Acrylic-Emulsion Sealant (GENERAL INTERIOR JOINTS):

1. Acrylic-emulsion or latex-rubber-modified acrylic-emulsion sealant compound; ;permanently flexible, on-staining and non-bleeding; recommended by manufacturer for general interior exposure.
2. Products offered by manufacturers to comply with requirements include the following:
   a. DAP Acrylic Latex Caulk; DAP, Inc.
   b. AC-20 Acrylic Latex; Pecora Corp.
   c. Acrylic Latex Caulk; Tremco, Inc.

2.04 FIRE-RESISTANT SEALANTS:

Fire resistant ratings established by testing per ASTM E 184 by Underwriters Laboratory, Inc. or testing and inspecting agency acceptable to governing authorities.

A. Foamed-in-place Sealant: Two part sealant formulated for use in through-penetration fire-stop system for filling openings around cables, conduit, pipes and similar penetrations through walls and floors.

1. Dow Corning Fire Stop Foam; Dow Corning Corp.
2. Pensil 851; General Electric Co.

B. Elastomeric Sealant: On-part sealant formulated for use in through-penetration fire-stop system for sealing openings around cables, conduit, pipes and similar penetrations through walls and floors.

1. Dow Corning Fire Stop Sealant; Dow Corning Corp.
2. 3M Fire Barrier Caulk CP-25; Electrical Products div./3M.
3. RTV 7403; General Electric Co.

2.05 MISCELLANEOUS MATERIALS:

A. Joint Cleaner: Provide type of joint cleaning compound recommended by sealant or caulking compound manufacturer, for joint surfaces to be cleaned.

B. Joint Primer/Sealer: Provide type of joint primer/sealer recommended y sealant manufacturer, for joint surfaces to be primed or sealed.

C. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape where applicable.

D. Sealant Backer Rod: Compressible rod stock polyethylene foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable non-absorptive material as recommended for compatibility with sealant by the sealant manufacturer. Provide size and shape of rod which will control joint depth for sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant placement, break bond of sealant at bottom of joint, form optimum shape of sealant bead on back side, and provide a highly compressible backer to minimize possibility of sealant extrusion when joint is compressed.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which the work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 MANUFACTURER'S INSTRUCTIONS: Comply with manufacturer's printed instructions except where more stringent requirements are shown or specified, and except where manufacturer's technical representative directs otherwise.

3.03 JOINT SURFACE PREPARATION:

A. Clean joint surfaces immediately before installation of sealantcompound. Remove dirt, insecure coatings, moisture and other substances which would interfere with bond of sealant or caulking compound.

B. For elastomeric sealants, do not proceed with installation of sealant over joint surfaces which have been painted, lacquered, waterproofed or treated with water repellent or other treatment or coating unless a laboratory test for durability (adhesion), in compliance with Paragraph 4.3.9 of FS TT-S-00227 has successfully demonstrated that sealant bond is not impaired by coating or treatment. If laboratory test has not been performed, or shows bond interference, remove coating or treatment from joint surfaces before installing sealant.

C. Etch concrete and masonry joint surfaces to remove excess alkalinity, unless sealant manufacturer's printed instructions indicate that alkalinity does not interfere with sealant bond and performance. Etch with 5% solution of muriatic acid; neutralize with dilute ammonia solution, rinse thoroughly with water and allow to dry before sealant installation.

D. Roughen joint surfaces on vitreous coated and similar non-porous materials, where sealant manufacturer's data indicates lower bond strength than for porous surfaces. Rub with fine abrasive to produce a dull sheen.

3.04 INSTALLATION:

A. Comply with manufacturer's printed instructions except where manufacturer's technical representative directs otherwise.

B. Elastomeric Sealant Installation Standard: Comply with ASTM C 962 as applicable.

C. Solvent-Release Curing Sealant Installation: Comply with ASTM C 804.

D. Latex Sealant Installation Standard: Comply with ASTM C 790.

E. Set joint filler units at proper depth or position in joint to coordinate with other work, including installation of bond breaker, backer rods and sealants. Do not leave voids or gaps between ends of joint filler units.

F. Install sealant backer rod for liquid sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for the application shown.

G. Install bond breaker tape where shown and where required by manufacturer's recommendations to ensure that elastomeric sealants will perform properly.

H. Employ only proven installation techniques, which will ensure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting of joint bond surfaces equally on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slightly below adjoining surfaces. Where horizontal joints are between a horizontal surface and a vertical surface, fill joint to form a slight cove, so that joint will not trap moisture and dirt.

J. Install sealants to depths as show or, if not shown, as recommended by sealant manufacturer but within the following general limitations, measured at center (thin) section of bead.

1. For sidewalks, pavements and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75%

    of joint width, and neither more that 5/8" deep nor less that 3/8" deep.

2. For normal moving joints sealed with elastomeric sealants, but not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 1/2" deep no less than 1/4" deep.
3. For joints sealed with non-elastomeric sealants, fill joints to a depth in the range or 75% to 125% of joint width.

K. Install fire-stopping sealants including forming, packing and other accessory materials to fill openings around penetrations to provide fire-stops with fire resistance ratings indicated for assembly in which penetrations occur. Comply with installation requirements established by testing and inspecting agency.

L. Spillage: Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate into voids of adjoining surfaces including exposed aggregate panels and similar rough textures. Use masking tape or other precautionary devices to prevent staining of adjoining surfaces, by either primer/sealer or the sealant compound.

M. Remove excess and spillage of compounds promptly as the work progresses. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage, without damage to adjoining surfaces or finishes.

3.05 CURE AND PROTECTION

A. Cure sealants in compliance with manufacturer's instructions and recommendations, to obtain high early bond strength, internal cohesive strength and surface durability. Do not cure in a manner which would significantly alter material's modulus of elasticity or other characteristics.

B. Repair sealant installation at leaks or, if leakage is excessive, replace sealant installation as directed by Architect.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division-1 General Requirements apply to the work of this Section.

1.02 DESCRIPTION OF WORK:

A. Extent of standard steel door frames is shown on the drawings and schedules.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. SPECIAL DOORS: Insulated metal doors.

B. PAINTING: Finish painting.

1.04 QUALITY ASSURANCE:

A. Provide door framescomplying with the Steel Door Institute "Recommended Specifications for Standard Steel Doors and Frames" (SDI 100), and as herein specified.

B. Fire Rated Assemblies: Provide fire-rated doors investigated and tested as fire door assemblies, complete with type of hardware used. Indentify each fire door with recognized testing laboratory labels, indicating applicable fire rating of steel doors. Construct and install assemblies to comply with NFPA Standard No. 80, and as herein specified.

C. Temperature Rise Rating: At stairwell enclosures, provide doors which have temperature rise rating of 450 degrees F. maximum in 30 minutes of fire exposure.

1.05 SUBMITTALS:

A. Product Data: Submit manufacturer's data for fabrication and installation instructions.

B. Shop Drawings: Submit for the fabrication and installation of steel door frames. Include details of each type, conditions at openings, details of construction, and details of joints and connections. Show anchorage and accessory items.

1. Provide a schedule of door frames using same reference numbers for details and openings as those on the contract drawings.

1.06 DELIVERY, STORAGE AND HANDLING:

A. Deliver hollow metal work cartoned or crated to provide protection during transit and job storage.

B. Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided the finish items are equal in all respects to new work and acceptable to the Architect; otherwise, remove and replace damaged items as directed.

C. Store door frames at the building site under cover. Place the units on at least 4" high wood sills or on the floors in a manner that will prevent rust and damage. Avoid the use of non-vented plastic or canvas shelters which could create a humidity chamber.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with specified requirements, provide one of the following:

1. Curries Mfg. Inc.
2. Ceco Corp.
3. Fenestra

2.02 MATERIALS:

A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 569 and ASTM A 568.

B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM A 568.

C. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, per ASTM A 526, with ASTM A 525, G60 zinc coating, mill phosphatized.

D. Supports and Anchors: Fabricate of not less than 18 gage galvanized sheet steel.

E. Inserts, Bolts and Fasteners: Manufacturer's standard units, except hot-dip galvanized items to be built into exterior walls, complying with ASTM A 153, Class C or D as applicable.

F. Shop-Applied Paint: For steel surfaces, use rust-inhibitive enamel or paint, either air-drying or baking, suitable as a base for specified finish paints.

2.03 FABRICATION, GENERAL:

A. Fabricate steel door frame units to be rigid, neat in appearance and free from defects, warp or buckle. Accurately form metal to required sizes and profiles. Wherever practicable, fit and assemble units in the manufacturer's plant. Clearly identify work that cannot be permanently factory-assembled before shipment, to assure proper assembly at the project site.

B. Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from only cold-rolled steel.

C. Fabricate frames, concealed stiffeners, reinforcement, edge channels, louvers and moldings from either cold-rolled or hot-rolled steel (at fabricator's option).

D. Fabricate exterior doors, panels, and frames from galvanized sheet steel. Close top and bottom edges of exterior doors as integral part of door construction or by addition of inverted steel channels.

E. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat Phillips or Jackson heads for exposed screws and bolts.

F. Thermal-Rated Assemblies: At exterior locations and elsewhere as scheduled, provide doors fabricated as thermal insulating door and frame assemblies and tested in accordance with ASTM C 236; minimum "R" factor of 14.9 (U = .067).

G. Finish Hardware Preparation.

1. Prepare hollow metal units to receive mortised and concealed finish hardware, including cutouts, reinforcing, drilling and tapping in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A 115 "Specifications for Door and Frame Preparation".
    a. For concealed overhead door closers, provide space, cutouts, reinforcing and provisions for fastening in top rail of doors or head of frames, as applicable.
2. Reinforce hollow metal units to receive surface-applied hardware. Drilling and tapping for surface-applied finish hardware may be done at project site.
3. Locate finish hardware as shown on final shop drawings, or if not shown, in accordance with "Recommended Locations for Builder's Hardware", published by the National Builders' Hardware Association.

H. Shop Painting:

1. Clean, treat and paint exposed surfaces of fabricated hollow metal units.
2. Clean steel surfaces of mill scale, rust, oil, grease, dirt and other foreign materials before the application of the shop coat of paint.
3. Apply shop coat of prime paint of even consistency to provide a uniformly finished surface ready to receive field-applied paint.

2.04 STANDARD STEEL DOORS:

A. Provide metal doors of types styles indicated on drawings and schedules.

B. Door Louvers: Provide sightproof louvers for interior doors where indicated, constructed of inverted V-shaped or Y-shaped blades formed of 24 gage cold-rolled steel set into 20 gage steel frame.

C. Fabricate interior doors of 18 gage steel.

D. Fabricate exterior doors of 16 gage galvanized steel.

2.05 STEEL FRAMES:

A. Provide metal frames of the types and styles indicated on the drawings or schedules and complying with S.D.I. 100 for minimum materials and construction requirements.

B. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, as shown on the drawings. Conceal all fastenings unless otherwise shown.

1. Fabricate frames with mitered corners, welded construction for exterior applications and knocked down for field assembly at interior gypsum board partitions.

C. Form exterior frames of hot-dip galvanized steel.

D. Door Silencers: Drill stops to receive 2 silencers on strike jambs of single-swing frames and 2 silencers on heads of double-swing frames.

E. Guards: Provide 26 gage steel boxes, welded to frame, at back of hardware cutouts where mortar or other materials might obstruct hardware operation.

F. Fabricate interior frames up to 5' wide of 16 gage steel; over 5' wide of 14 gage steel.

G. Fabricate exterior frames of 14 gage steel.

PART 3 EXECUTION

3.01 INSPECTION: Examine substrate and conditions under which steel door frames are to be installed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 INSTALLATION:

A. General: Install hollow metal units in accordance with final shop drawings and manufacturer's data, and as herein specified.

B. Placing Frames:

1. Comply with the provisions of S.D.I. 105 unless otherwise indicated.
2. Except for frames located at in-place concrete or masonry and at drywall installations, place frames prior to construction of enclosing walls and ceilings. Set frames accurately in position, plumbed, aligned and braced securely until permanent anchors are set. After wall construction is completed, remove

temporary braces and spreaders leaving surfaces smooth and undamaged.

3. At in-place or masonry construction, set frames and secure to adjacent constructin with machine screws and masonry anchorage devices.
4. In masonry construction, locate 3 wall anchors per jamb at hinge and strike levels. Building-in of anchors and grouting of frames is specified in UNIT MASONRY SECTION.
5. Install fire-rated frames in accordance with NFPA Std. No. 80.
6. In metal stud partitions install at least 3 wall anchors per jamb at hinge and strike levels. In open steel stud partitions, place studs in wall anchor notches and wire tie. In closed steel stud partitions, attach wall anchors to studs with tapping screws.

C. Door installation:

1. Fit hollow metal doors accurately in frames, within clearances specified in SDI-100.
2. Place fire-rated doors with clearances as specified in NFPA Standard No. 80.

3.03 ADJUST AND CLEAN:

A. Final Adjustments:

1. Check and readjust operating finish hardware items in hollow metal work just prior to final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including door frames which are warped, bowed or otherwise damaged.
2. Prime Coat Touch-Up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements apply to work specified in this section.

1.02 DESCRIPTION OF WORK:

A. Extent and location of each type of wood door is shown on drawings and in schedules.

B. Types of doors required:

1. Hollow core flush wood doors with hardboard faces.
2. Solid core flush wood doors with hardboard faces.

C. Factory-fitting to frames (prefitting) and factory-preparation for hardware (premachining) for wood doors is included in this section.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. FINISH CARPENTRY: Wood door frames.
B. METAL DOORS AND FRAMES: Door frames.
C. SPECIAL DOORS: Entrance doors.
D. HARDWARE

1.04 QUALITY ASSURANCE

A. NWMA Quality Marking: Mark each wood door with NWMA Wood Flush Door Certification Hallmark certifying compliance with applicable requirements of ANSI/NWMA I.S. I Series. For manufacturers not participating in NWMA Hallmark Program, a certification of compliance may be substituted for marking of individual doors.

B. Fire-Rated Wood Doors: Provide wood doors with fire-resistance ratings indicated or required to comply with governing regulations and which are identical in materials and type of construction to those used in assemblies which have been tested in compliance with ASTM E 152 and are labeled and listed by a testing and inspection organization acceptable to authority having jurisdiction.

C. Manufacturer: Obtain doors from a single manufacturer to ensure uniformity in quality of appearance and construction.

D. Comply with the applicable requirements of the following standards unless otherwise indicated:

1. ANSI/NWMA I.S. I, "Industry Standard of Wood Flush Doors" published by National Woodwork Manufacturers Association (NWMA).
2. AWI Quality Standards: Section 1300 "Architectural Flush Doors" of "Architectural Woodwork Quality Standards" published by Architectural Woodwork Institute (AWI). Designation for grade and door construction under types of doors refers to this standard.

1.05 SUBMITTALS:

A. Product Data: Submit door manufacturer's product data, specifications and installation instructions for each type of wood door.

1. Include details of core and edge construction, trim for openings and louvers (if any) and similar components.
2. Include certifications as may be required to show compliance with specifications.

B. Specific Product Warranty: Submit written agreement on door manufacturer's standard form signed by Manufacturer, Installer and Contractor, agreeing to repair or replace defective doors which have warped (bow, cup or twist) or which show telegraphing of core construction below in face veneers, or do not conform to tolerance limitations of NWM and AWI.

1. The warranty shall also include refinishing and reinstallation which may be required due to repair or replacement of defective doors.
2. Warranty shall be in effect during following period of time after date of substantial completion:
   a. Hollow Core Flush Interior Doors: One year.
   b. Solid Core Flush Interior Doors: Five years.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Protect wood doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with the "On-Site Core" recommendations of NWMA pamphlet "Care and Finishing of Wood Doors" and with manufacturer's instructions.

1. Package doors at factory prior to shipping using manufacturer's standard method.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. Cal-Wood Door Div., Timberland Ind., Inc.
2. Glen-Mar Door Mfg. Co.
3. Weyerhauser Company.

2.02 MATERIALS AND COMPONENTS:

A. General: Provide wood doors complying with applicable requirements of referenced standards for kinds and types of doors indicated.

B. Exposed Surfaces: Provide kind shown or scheduled and as further specified. Provide same exposed surface material on both faces of each door, unless otherwise indicated.

2.03 GENERAL FABRICATION REQUIREMENTS: Wherever transom panels or side panels of wood are shown in same framing systems as wood doors, provide panels which match quality and appearance of associated wood doors, unless otherwise indicated. Fabricate matching panels with same construction, exposed surfaces and finish as specified for associated doors.

2.04 INTERIOR FLUSH WOOD DOORS:

A. Hollow Core Doors for Painted Finish:

1. Faces: Hardboard
2. Grade: Custom
3. Core Construction: SHC (Standard Hollow Core).
4. Bi-fold Hardware: Provide bi-folding doors as a packaged unit complete with operating hardware including hinges, top track, bottom pivots and 1-1/2" diameter satin chrome pulls prepared for installation; sizes as indicated.

B. Solid Core Doors for Painted Finish:

1. Faces: Hardboard.
2. Grade: Custom.
3. Core Construction: PC (Particleboard Core).

C. Fire-Rated Solid Core Doors:

1. Faces and AWI Grade: Provide to match non-rated doors.
2. Core Construction: As required to provide fire-resistance rating indicated.
3. Edge Construction: Standard laminated edge construction for improved screw-holding capability and split resistance.

2.05 PREFITTING AND PREPARATION FOR HARDWARE:

A. Prefit and premachine wood doors at factory.

B. Comply with tolerance requirements of AWI for prefitting. Machine doors for hardware requiring cutting of doors. Comply with final hardware schedules and door frame shop drawings and with hardware templates and other essential information required to ensure proper fit of doors and hardware.

1. Take accurate field measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with machining in factory.

PART 3 EXECUTION

3.01 INSPECTION: Examine door frames and verify that frames are correct type and have been installed as required for proper hanging of corresponding doors. Do not proceed with installation until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 INSTALLATION:

A. Condition doors to average prevailing humidity in installation area prior to hanging.

B. Hardware: For installation see HARDWARE SECTION of these specifications.

C. Manufacturer's Instructions: Install wood doors in accordance with manufacturer's instructions.

D. Prefit Doors: Fit to frames and machine for hardware to whatever extent not previously worked at factory as required for proper fit and uniform clearance at each edge.

E. Clearance: For non-rated doors provide clearances of 1/8" at jambs and heads; 1/8" at meeting stiles for pairs of doors; and 1/2" from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4" clearance from bottom of door to top of threshold.

1. For fire-rated doors, provide clearances complying with NFPA 80.

F. Job-Site Finished Doors: See PAINTING SECTION of these specifications for finishing requirements.

3.03 ADJUST AND CLEAN:

A. Operation: Rehang or replace doors which do not swing or operate freely, as directed by Architect.

B. Protection and Completed Work: Protect installed wood doors from damage or deterioration until acceptance of work.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. The extent of insulated metal clad doors is shown on the drawings.

B. Insulated metal clad doors are hereby defined to be metal covered insulated doors complete with framed assemblies; prehung and prepared for hardware installation; primed for paint finish.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. METAL DOORS AND FRAMES.
B. WOOD DOORS.
C. HARDWARE: Locksets.

1.04 QUALITY ASSURANCE: Provide insulated metal clad doors as a complete unit by one manufacturer including frame, mounting hardware and installation components.

1.05 SUBMITTALS: Submit manufacturer's technical data, rough-in drawings, and installation instructions. Indicate on drawings wall opening dimensions and any necessary adjustments to designed wall thickness and other requirements for proper installation.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. Benchmark, General Products Co., Inc.
2. Fenestra Corp.
3. Peachtree Doors, Inc.

2.02 INSULATED DOORS:

A. Construction: Two steel faces of 24 gage galvanized steel with formed edges, bonded to a foam insulating core; reinforced for hardware attachment.

1. Steel skins formed to provide a complete thermal break between inside and outside.
   a. Glazed vision panel where indicated.

B. Insulation: Full monolithic insulating core of closed-cell foam.

1. Provide an R-Factor or 14 (min.).

C. Frame: Manufacturer's standard: Wood or steel.

D. Accessories: Include the following:

1. Galvanized hinges, primed for painting.
2. Aluminum Sill: Adjustable with air-tight seal.
3. Perimeter weatherstripping: Magnetic on head and lock jamb and compression on hinge jamb.

E. Finish: Manufacturer's standard primed for paint finish.

F. Sizes and Types: As shown on the drawings.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which insulated metal clad doors are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 INSTALLATION:

A. Install doors in accordance with manufacturer's written instructions.

B. Locksets for insulated doors are specified in HARDWARE SECTION.

C. Adjust door for smooth weathertight operation.

D. Touch up damaged areas with compatible paint.

3.03 PROTECTION: Protect door assemblies against damage or deterioration until acceptance of the work.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1, General Requirements, apply to work of this section.

1.02 DECRIPTION OF WORK:

A. Extent of aluminum doors and frames is indicated on drawings and schedules.

B. Types of aluminum doors and frames required are:

1. Entrance doors.
2. Frames for entrance doors.
3. Frames for glazing.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. JOINT SEALERS: Perimeter sealing.
B. GLASS AND GLAZING
C. HARDWARE: Cylinders for locks.

1.04 SYSTEM PERFORMANCES: Provide assemblies designed and fabricated to comply with requirements listed below:

A. Thermal Movement: Allow for expansion and contraction resulting from ambient temperature range of 120 degrees F.

B. Wind Loading: Uniform pressure of 30 psf inward and 20 psf outward per ASTM E 330.

C. Transmission Characteristics of Fixed Framing: Comply with requirements and test methods as follows:

1. Air and Water Leakages: Air infiltration of not more than 0.06 CFM per sq. ft. of fixed area per ASTM E 283 and no uncontrolled water penetration per ASTM E 331 at pressure differential of 6.24 psf (excluding operable door edges).
2. Condensation Resistance: Provide units tested for thermal performance in accordance with AAMA 1502 showing condensation resistance factor (CRF) of not less than 45.
3. Thermal Transmittance: Provide framing systems that have an overall U-value of not more than 0.65 BTU/(hr. x sq.ft. x deg. F.) at 15 mph exterior wind velocity when tested in accordance with AAMA 1503.

D. Transmission Characteristics of Entrances: Entrance doors with jamb and head frames to comply with requirements and test methods as follows:

1. Air Leakage: Air infiltration per linear foot of perimeter crack of not more than 0.50 CFM for single doors and 1.0 CFM for pairs of doors per ASTM E 283 at pressure differential of 1.567 psf.

1.05 QUALITY ASSURANCE: Drawings shown spacings of members as well as profile and similar dimensional requirements. Minor deviations will be accepted when, in Architect's judgement, such deviations do not detract from design concept or intended performances.

1.06 SUBMITTALS:

A. Product Data: Specifications, standard details, and installation recommendations, including test reports certifying performance requirements.

B. Shop Drawings: For fabrication and installation.

C. Samples: Each type and color of aluminum finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS: Subject to compliance with requirements, provide products of one of the following:

A. Amarlite Corporation.
B. Kawneer Company, Inc.
C. PPG Industries, Inc.

2.02 MATERIALS AND ACCESSORIES:

A. Aluminum Members: Alloy and temper recommended by manufacturer; ASTM B 221 for extrusions, ASTM B 209 for sheet/plate.

B. Fasteners: Aluminum or non-magnetic stainless steel.

1. Do not use exposed fasteners except where unavoidable.
2. Provide Phillips flat-head machine screws for exposed fasteners and match adjacent finish.

C. Concealed Flashings: Dead-soft stainless steel, 26 gage or extruded aluminum 0062" minimum, ally and type selected for compatibility with other components.

D. Brackets and Reinforcements: High-strength aluminum, non-magnetic stainless steel or hot-dip galvanized steel per ASTM A 386.

E. Concrete/Masonry Inserts: Hot-dip galvanized steel per ASTM A 386.

F. Bituminous Coatings: Cold-applied asphalt mastic per SSPC-PS 12, compounded for 30-mil thickness per coat.

G. Compression Weatherstripping: Manufacturer's standard replaceable stripping of either molded neoprene (ASTM D 2000) or molded PVC (ASTM D 2287).

H. Sliding Weatherstripping: Manufacturer's standard replaceable stripping of wool, polypropylene or nylon woven pile, with nylon or aluminum backing per AAMA 701.2.

J. Glass and Glazing Mateirals: Comply with "GLASS AND GLAZING" SECTION.

2.03 HARDWARE:

A. General: Refer to HARDWARE SECTION for hardware items not indicated herein.

B. Provide door manufacturer's recommended standard heavy-duty hardware units as indicated, finished to match door:

1. Offset Pivots: Assemblies complying with ANSI A 156.4, Grade 1, exposed parts of cast aluminum; provide intermediate pivot.
2. Overhead Closers: Concealed, single acting, Grade 2 with concealed arm and track per ANSI A 156.4.
3. Deadlocks: Mortised maximum security type, with minimum 1" long pivoted bolt and stainless steel strike box; complying with ANSI A 156.5, Grade 1.
4. Panic Hardware: Concealed-rod type panic exit devices actuated by full-width crash bar; comply with UL 305; where indicated provide latch releasing mechanism recessed into crossrail of doors and actuated by push panel.
5. Door-mounted Stop: Flip-up type with rubber shoe, for mounting on lower rail.
6. Flushbolts: Edge mortised type, for inactive leaves of pairs of doors.
7. Push/Pull Handles: Units of style indicated.
8. Thresholds: Extruded bronze, complete with anchors and clips, of size indicated.

2.04 FABRICATION:

A. General:

1. Prefabrication: to greatest extent possible, complete fabrication, assembly, finishing, hardware application, and other work before shipment to project site. Disassemble components only as necessary for shipment and installation.
    a. Preglaze door units where possible.
2. Do not drill and tap for surface-mounted hardware items unitl installation.
3. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of metal work to prevent damage to exposed finish surfaces.

B. Welding: Comply with AWS recommendations to avoid discoloration; grind exposed welds smooth and restore mechanical finish.

C. Reinforcing: Install reinforcing as necessary for performance requirements; separate dissimilar metals with bituminous paint.

D. Continuity: Maintain accurate relation of planes and angles, with hairline fit of contacting members.

E. Fasteners: Conceal fasteners wherever possible.

F. Weatherstripping: For exterior doors, provide compression weatherstipping against fixed stops; at other edges, provide sliding weatherstipping retained in adjustable strip mortised into door edge.

1. Provide EPDM/vinyl blade gasket in bottom door rail, adjustable for contact with threshold.
2. At interior doors provide neoprene silencers on stops.

2.05 FRAMING SYSTEM:

A. Thermal Break Construction: Fabricate aluminum framing system with integrally concealed, low condutance thermal barrier, located between exterior materials and exposed interior members, in manner which eliminates direct metal-to-metal contact.

B. Provide glazing system for frames to receive glass. Design system for replacement of glass, but non-removal of glass from the exterior.

C. Fabricate frame assemblies for exterior walls with flashing and weeps to drain penetrating moisture to exterior. Allow for thermal expansion of exterior units.

2.06 STILE-AND-RAIL TYPE ALUMINUM DOORS:

A. Frame: Provide tubular frame members, fabricated with mechanical joints using heavy inserted reinforcing plates and concealed tie-rods or j-bolts, or fabricate with structurally welded joints.

B. Design: Provide 1-3/4" thick doors as indicated.

C. Glazing: Fabricate doors to facilitate replacement of glass without disassembly of door stiles and rails. Provide snap-on extruded aluminum glazing stops, with exterior stops anchored for non-removal.

1. Glaze with clear insulated tempered glass.

2.07 FINISH: High performance pigmented organic coating, AA-C12C42R1x. Prepare, pretreat and apply manufacturer's standard coating to exposed metal surfaces to comply wth resin manufacturer's instructions; custom color as selected by Architect.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which the work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 PREPARATION: Wherever possible, take field measurements prior to preparation of shop drawings and fabrication. Proceed with fabrication tolerances as necessary when field measurements might delay work.

3.03 INSTALLATION:

A. Comply with manufacturer's instructions and recommendations.

B. Set units plumb level, and true to line, without warp or rack. Anchor securely in place, separating aluminum and corrodible surfaces from sources of corrosion at points of contact.

C. Apply surface-mounted hardware items, complying with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.

D. Set sill members in bed of sealant.

E. Refer to "GLASS AND GLAZING" SECTION for installation of glass.

3.04 ADJUST AND CLEAN:

A. Adjust operating hardware to function properly.

B. Clean completed system, inside and out.

C. Protect work from damage and deterioration.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements apply to the work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of each type of aluminum window unit is indicated on drawings and schedules.

B. Types of aluminum window units required:

1. Single-hung.
2. Fixed.

C. Applications of aluminum windows on project include:

1. Individual units set in existing wall construction.
2. Individual units set in new wall construction.

D. Provide sliding door units where indicated to match aluminum windows as work of this section.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. JOINT SEALANTS: Perimeter sealing.

1.04 SYSTEM DESCRIPTION:

A. Performance and Testing: Comply with air infiltration tests, water resistance tests, uniform load deflection tests, and uniform load structural tests specified in ANSI/AAMA 101-85 for type and classification of window units required in each case.

1. Where the required design pressure exceeds the minimum for the specified window grade, comply with requriements of AAMA 101-85 Section 3, "Optional Performance Classes" for higher than minimum performance class.

B. Condensation Resistance: Where window units are indicated to be of "thermal-break construction", provide units which have been tested for thermal performance (AAMA 1502) showing a condensation resistance factor (CRF) of at least 45.

C. Testing: Where manufacturer's standard window units comply with requirements and have been tested in accordance with specified tests, provide certification by manufacturer showing compliance with such tests; otherwise, perform required tests through a recognized testing laboratory or agency and provide certified test results.

1.05 QUALITY ASSURANCE: Drawings indicate size, profiles and dimensional requirements of aluminum windows. Window units having minor deviations from dimensions and profiles indicated on drawings may be accepted, provide such deviations do not materially detract from design concept or intended performances and subject to approval of the Architect.

1.06 REFERENCES: Except as otherwise indicated, requirements for aluminum windows, terminology and standards of performance, and fabrication workmanship are those specified and recommended in ANSI/AAMA 101-85 and applicable general recommendations published in AAMA and AA.

1.07 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data, recommendations, and standard details for aluminum window units, including certified test laboratory reports as necessary to show compliance with requirements.

B. Shop Drawings: Submit shop drawings, including wall elevations at 1/4" scale, typical unit elevations at 3/4" scale, and full size detail sections of every typical composite member. Show anchors,, hardware, operators, and other components not included in manufacturer's standard data. Include glazing details.

C. Samples: Submit samples of each required aluminum finish, on 12" long sections of extrusion shapes as required for window units.

1. Architect reserves right to require additional samples which will show fabrication techniques, workmanship of component parts, and design of hardware and other exposed auxiliary items.

D. Certification: Where manufacturer's standard window units comply with requirements and have been tested in accordance with specified tests, provide certification by manufacturer showing compliance with such test; otherwise, perform required tests through a recognized testing laboratory or agency and provide certified test results.

1.08 SPECIAL PROJECT WARRANTY: Submit written warranty signed by Manufacturer, installer and Contractor, agreeing to replace aluminum window units which fail in materials or workmanship within 3 years of date of acceptance. Failure of materials or workmanship shall include (but not be limited to) excessive leakage of air infiltration , excessive deflections, faulty operation of sash, deterioration of finish or metal in excess of normal weathering, and defects in hardware, weatherstripping, and other components of work.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide window units by one of the following:

1. Acorn Building Components, Inc.
2. Efco Corp.
3. Traco.

2.02 MATERIALS:

A. Aluminum Extrusions: Alloy and temper recommended by window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000 psi ultimate tensile strength and not less than 0.062" thickness at any location for main frame and sash members. Comply with ASTM B 221.

B. Fasteners: Aluminum, non-magnetic stainless steel, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors and other components of window units.

1. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125" thick, reinforce interior with aluminum or non-magnetic stainless steel to receive screw threads, or provide standard non-corrosive pressed-in splined grommet nuts.
2. Do not use exposed fasteners except where unavoidable for application of hardware. Match finish adjoining metal.
3. Provide Phillips flat-head machine screws for exposed fasteners.

C. Anchors, Clips and Window Accessories: Depending on strength and corrosion-inhibiting requirements, fabricate units of aluminum, non-magnetic stainless steel, or hot-dip coated steel or iron complying with ASTM A 386.

D. Compression Glazing Strips and Weatherstripping: At manufacturer's option, provide molded neoprene gaskets complying with ASTM D 2000 Designation 2BC415 to 3BC620, molded PVC gaskets complying with ASTM D 2287, or molded expanded neoprene gaskets complying with ASTM C 509, Grade 4.

E. Sliding Weatherstripping: Provide woven pile weatherstripping of wool, polypropylene or nylon pile and resin-impregnated backing fabric, and aluminum backing strip; comply with AAMA 701.2.

F. Sealant: Unless otherwise indicated for sealants required within fabricated window units, provide type recommended by window manufacturer for joint size and movement, to remain permanently elastic, non-shrinking and non-migrating. Comply with Division 7 sections for installation of sealants.

G. Glass and Glazing: Provide manufacturer's standard insulating glass. Meet glass criteria specified in GLASS AND GLAZING SECTION.

1. Use manufacturer's standard extruded flexible gaskets for glazing.

H. Wire Fabric (Insect): 18 x 18, 18 x 16, 18 x 14 mesh of 0.013" diameter aluminum wire, complying with FS RR-W-365, Type VII.

2.03 WINDOW CLASSIFICATION (GRADE): Commercial windows complying with AAMA Grade and Performance Class C30.

2.04 WINDOW TYPES (OPERATION): Following paragraphs define operating arrangement for types of sash (ventilators) required in window units and specify minimum provisions for each type. Drawings indicate which panels of each window unit are operable sash and which are fixed.

A. Double-Hung Windows: Units containing one or more balanced vertically-sliding sash; requiring pair of counterbalancing mechanisms complying with AAMA 902 "Sash Balance Specifications," pair of lift handles on lower rail of lower sash, pair of pull-down handles on bottom of meeting rail of upper sash (if operable). Provide latches at meeting rails to lock sash in closed position.

1. Provide units which have "tilt-in" feature permitting both sides of sash to be cleaned from interior.

B. Fixed Windows: Units consisting of a glazed frame installed into one opening and are not operable.

2.05 SLIDING ALUMINUM DOORS:

A. Comply with requirements of ANSI/AAMA 101 for "Sliding Glass Doors for Commercial Type Buildings", SGD-C20.

B. Provide thermal-break construction and glaze with insulating glass to meet criteria specified in GLASS AND GLAZING SECTION.

1. Provide manufacturer's standard screen for operating panels of doors; match finish of door.

C. Provide manufacturer's standard operating hardware as selected by Architect.

2.06 FABRICATION AND ACCESSORIES:

A. General: Provide manufacturer's standard fabrication and accessories which comply with indicated standards and are reglazable without dismantling of sash framing, except to extent more specified or more stringent requirements are indicated. Include complete system for assembly of components and anchorage of window units, and prepare sash for glazing except where preglazing at factory is indicated.

B. Sizes and Profiles: Required sizes for window units and profile requirements are shown on drawings. Variable dimensions (if any) are indicated along with maximum and minimum dimensions as required to achieve design requirements and coordination with other work.

1. Details on drawings are based upon standard details by one or more manufacturers. It is intended that similar details by other manufacturers will be acceptable, provide they comply with size requirements, minimum/maximum profile requirements, and performance standards as indicated or specified.

C. Thermal-Break Construction: Fabricate aluminum window units with an integrally concealed low conductance thermal barrier, located between exterior materials and window members exposed on interior, in manner which eliminates direct metal-to-metal contact. Provide manufacturer's standard construction which has been in use on similar window units for period of not less than 5 years, has been tested to demonstrate resistance to thermal conductance and condensation, and has been tested to show adequate strength and security of glass retention.

D. Coordination of Fabrication: Where possible, check actual window openings in construction work by accurate field measurement before fabrication, and show recorded measurements on final shop drawings. However, coordinate fabrication schedule with construction progress as directed by Contractor to avoid delay of work. Where necessary, proceed with fabrication without field measurements, and coordinate installation tolerances to ensure proper fit of window units.

E. Preglazed Fabrication: Preglaze window units at factory where possible and practical for applications indicated. Comply with requirements of GLASS AND GLAZING SECTION in addition to requirements of ANSI/AAMA 101-85.

F. Provide means of drainage for water and condensation which may accumulate in members of window units.

G. Weatherstripping: Provide compression-type weatherstripping at perimeter of each operating sash, except provide sliding weatherstripping at all locations where sash rails slide horizontally or vertically along frame of units.

H. Provide insect screen unit for each operable exterior sash, except as otherwise indicated. Locate screen units on outside of sash. Design window units and hardware to accommodate screens in a tightfitting removable arrangement, with a minimum of exposed fasteners and latches.

1. Fabricate screen frames of either extruded or formed aluminum tubular-shaped members of 0.040" minimum wall thickness, with mitered or coped joints and concealed mechanical fasteners, with removable PVC spline-anchor concealing edge of screen fabric. Finish frames to match window units.

2.07 ALUMINUM WINDOW FINISH: Provide shop applied organic coating of type and custom color selected by Architect, tested and certified by window manufacturer to comply with AAMA 603.6.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which aluminum window work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 INSTALLATION:

A. Comply with manufacturer's specifications and recommendations for installation of window units, hardware, operators, and other components of work.

B. Set units plumb, level, and true to line , without warp or rack of frames or sash. Anchor securely in place. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action.

C. Set sill members and other members in bed of compound as shown, or with joint fillers or gaskets as shown, to provide weathertight construction. Refer to JOINT SEALANTS SECTION for compounds, to be installed with window units.

3.03 ADJUST AND CLEAN:

A. Adjust operating sash and hardware to provide tight fit at contact points and at weatherstripping, and to ensure smooth operation and weathertight closure.

B. Clean aluminum surfaces promptly after installation of windows, exercising care to avoid damage to protective coatings and finishes. Remove excess glazing and sealant compounds, dirt and other substances. Lubricate hardware and moving parts.

C. Clean glass of preglazed units promptly after installation of windows; comply with requirements of GLASS AND GLAZING section for cleaning and maintenance.

D. Initiate and maintain protections and other precautions required to ensure that window units will be without damage or deterioration (other than normal weathering) at time of acceptance.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: The drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements apply to the work of this section.

1.02 DESCRIPTION OF WORK:

A. Definition: Hardware includes items known commercially as builders hardware which are required for swing, sliding and folding doors, except special types of unique hardware specified in the same section as the door and door frame. Types of items in this section include (but are not necessarily limited to):

1. Hinges.
2. Lock cylinders and keys.
3. Lock and latch sets.
4. Bolts.
5. Door control devices.
6. Door trim units.
7. Thresholds.
8. Weatherstripping.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. ALUMINUM WINDOWS: Window hardware.

1.04 QUALITY ASSURANCE:

A. Manufacturer: Obtain each kind of hardware (latch and lock sets, hinges, closers, etc.) from only one manufacturer, although several may be indicated as offering products complying with requirements.

B. Supplier: A recognized builders hardware supplier who has been furnishing hardware in the project's vicinity for a period of not less than 2 years, and who is, or employees an experienced hardware consultant who is available, at reasonable times during the course of the work, for consultation about project's hardware requirements, to Owner, Architect and Contractor.

1.05 SUBMITTALS:

A. Product Data: Submit manufacturer's technical information for each item of hardware. Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and finish.

B. Hardware Schedule: Submit final hardware schedule in manner indicated below. Hardware schedules are intended for coordination of work.

1. Final Hardware Schedule Content: Based on hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or

opening. Include the following information:

- a. Type, style, function, size and finish of each hardware item.
- b. Name and manufacturer of each item.
- c. Fastenings and other pertinent information.
- d. Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
- e. Explanation of all abbreviations, symbols, codes, etc., contained in schedule.
- f. Mounting locations for hardware.
- g. Door and frame sizes and materials.

2. Submittal Sequence: Submit initial draft of schedule along with essential product data in order to facilitate the fabrication of other work (e.g., hollow metal frame) which is critical in the project construction schedule. Submit final draft of schedule after samples, product data, coordination with shop drawings of other work, delivery schedules, and similar information has been completed and accepted.

C. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

D. Samples: Prior to submittal of the final hardware schedule and prior to final ordering of hardware, submit one sample of each type of exposed hardware unit, finished as required, and tagged with full description for coordination with schedule.

1. Samples will be returned to the supplier. Units which are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be used in the work, within limitations of keying coordination requirements.

1.06 PRODUCT HANDLING:

A. Packaging of hardware, on a set by set basis, is the responsibility of the supplier. As material is received by the hardware supplier from the various manufacturers, sort and repackage in containers marked with the hardware set number. Two or more identical sets may be packed in the same container.

B. Inventory hardware jointly with representatives of the hardware supplier and the hardware installer until each is satisfied that the count is correct.

C. Provide secure lock-up for hardware delivered to the project, but not yet installed. Control handling and installation of hardware items which are not immediately replaceable, so that the completion of the work will not be delayed by hardware losses, before and after installation.

1.07 JOB CONDITIONS:

A. Coordination: Coordinate hardware with other work. Tag each item or package separately, with identification related to the final hardware schedule, and include basic installation instructions in the package. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation.

B. Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check the shop drawings of such other work, to confirm that adequate provisions are made.

PART 2 PRODUCTS

2.01 SCHEDULED HARDWARE:

A. Requirements for design, grade, function, finish, size and other distinctive qualities of each type of builders hardware is indicated in the Hardware Data Sheet and Hardware Schedule at the end of this section.

1. Manufacturer's product designations: One or more manufacturers are listed for each hardware type required. An asterisk (*) after a manufacturer's name indicates whose product is used in the Hardware Schedule for purposes of establishing minimum requirements. Provide either the product designated, or where more than one manufacturer is listed, the comparable product of one of the other manufacturers which comply with requirements including those specified elsewhere in this section.

2.02 MATERIALS AND FABRICATIONS:

A. General:

1. Hand of Door: The drawings show the direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of the door movement as shown.
2. Manufacturer's Name Plate: Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location (omit removable nameplated), except in conjunction with required UL labels and as otherwise acceptable to the Architect.
   a. Manufacturer's identification will be permitted on rim of lock cylinders only.
3. Base Metals: Product hardware units of the basic metal and forming method indicated, using the manufacturer's standard metal alloy, composition, temper and hardness, but in no case of less (commercially recognized) quality than specified for the applicable hardware units by FS FF-H-106, FS FF-G-111, FS FF-H-

116, and FS FF-H-121. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

4. Fasteners: Manufacture hardware to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.
5. Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match the hardware finish or, if exposed in surfaces of other work, to match the finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.
6. Provide concealed fasteners for hardware units which are exposed when the door is closed, except to the extent no standard units of the type specified are available with concealed fasteners.
7. Tools for Maintenance: Furnish a complete set of specialized tools as needed for Owner's continued adjustment, maintenance, and removal and replacement of builder's hardware.

2.03 HINGES:

A. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

B. Screws: Furnish Phillips flat-head all-purpose or machine screws for installation of units, except furnish Phillips flat-head all-purpose or wood screws for installation of units into wood. Finish screw heads to match surface of hinges or pivots.

C. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

1. Steel Hinges: Steel pins.
2. Non-ferrous Hinges: Stainless steel pins.
3. Exterior Doors: Non-removable pins.
4. Interior Doors: Non-rising pins.
5. Tips: Flat button and matching plug, finished to match leaves.

D. Provide ball bearing hinges for doors with closers.

E. Number of hinges: Provide number of hinges indicated but not less than 3 hinges for door leaf for doors 90" or less in height and one additional hinge for each 30" of additional height.

2.03 LOCK CYLINDERS AND KEYING:

A. General: Supplier will meet with Owner to finalize keying requirements and obtain final instructions in writing.

B. Standard System: Provide new masterkey system for project.

C. Equip locks with manufacturer's 6-pin tumbler cylinder, with construction master key feature, which permits voiding of construction keys without cylinder removal.

D. Manufacturer: Subject to compliance with requirements, provide products of one of the following:

1. Sargent and Company, Div. Walter Kidde & Co.
2. Hardware Division, Emhart Industries, Inc.
3. Yale Security Products.

E. Metals: Construct lock cylinder parts from brass/bronze, stainless steel or nickel silver.

F. Comply with Owner's instructions for masterkeying and, except as otherwise indicated, provide individual change key for each lock which is not designated to be keyed alike with a group of related locks.

G. Key Material: Provide keys of nickel silver only

H. Key Quality: Furnish 4 change keys for each lock and 5 master keys for each master system.

1. Deliver keys to Owner's representative.

J. Provide a key control system including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of the number of locks required for the project.

2.05 LOCKS, LATCHES AND BOLTS:

A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set.

B. Lock Throw: Provide 5/8" minimum throw of latch. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.

2.06 CLOSERS AND DOOR CONTROL DEVICES:

A. Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather and anticipated frequency of use.

1. Where parallel arms are indicated for closers, provide closer unit of size larger than recommended for use with standard arms.
2. Provide parallel arms for all overhead closers.

B. Provide black resilient parts for exposed bumpers.

2.07 DOOR TRIM UNITS:

A. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units; either machine screw of self-tapping screw.

B. Fabricate protection plates (armor, kick or mop) not more than 1-1/2" on stop side smaller than the door width x the height indicated.

1. Metal Plates: Stainless steel 18 gage.

2.08 STRIPPING AND SEALS:

A. Continuity of Stripping: Stripping at each opening is required to be continuous without unnecessary interruptions at door corners and hardware.

B. Replace Seal Strips: Resilient or flexible seal strips of every unit required to be easily replaceable and readily available from stocks maintained by the manufacturer.

C. Weatherstripping: Provide weatherstripping where indicated, properly prepared for attachment to supporting units.

1. Provide spring-metal type weatherstripping at jambs and head, of manufacturer's standard design for the application indicated, of spring stainless steel, 0.005" minimum thickness.
2. Provide threshold-contact type weatherstripping at door bottom, including resilient insert and metal housing of extruded aluminum with natural anodized finish; 0.062" minimum thickness of main walls and flanges; solid neoprene loop seal strip.

2.09 THRESHOLDS:

A. Metal: Extruded aluminum, smooth commercial finish.

B. Surface Pattern: Grooved tread, manufacturer's standard.

C. Width: As indicated, but not less than 4" if not otherwise indicated.

D. Minimum Thicknesses: Extrusions: 0.25" for direct tread surfaces, 0.1875" for secondary tread surfaces and 0.125 for unexposed flanges and legs.

E. Construction: Single-piece or multiple-piece construction at Contractor's option, complying with manufacturer's recommendations.

F. Profile: Provide manufacturer's standard unit which conforms with the minimum size and profile requirements as indicated.

1. For exterior doors, provide profile designed to form a weatherseal, of the appropriate type for the swing of door.

a. Floor drop: Except where no change in floor elevations is shown (from inside to outside), provide profile which accomodates 1/2" drop in floor elevation, unless another dimension is shown.
b. For swing-out doors, provide units with stop to act as weather bar.
c. For swing-in doors, provide hook-bar and drain channel to minimize infiltration of moisture and air.

2.10 HARDWARE FINISHES:

A. Provide matching finishes for hardware units at each door or opening, to the greatest extent possible, and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units for hardware exposed at the same door or opening. In general, match items to the manufacturer's standard finish for the latch and lock set (or push-pull units if no latch-lock sets) for color and texture.

B. Provide finishes which match those established by BHMA.

C. Provide quality of finish, including thickness of plating or coating composition, hardness and other qualities complying with manufacturer's standards.

D. Provide protective lacquer coating on all exposed hardware finishes of aluminum.

E. Hardware finish: As selected by Architect.

F. Door Closure finish: Lacquered aluminum.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which the work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 INSTALLATION:

A. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Architect.

B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in Division 9 sections. Do not install surface-mounted items until finishes have been completed on the substrate.

C. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

3.03 ADJUST AND CLEAN:

A. Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

B. Final adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

3.04 DOOR HARDWARE DATA:

A. Acceptable Manufacturers:

1. Butts and Hinges: Hager; Lawrence; Stanley.
2. Locks: Russwin; Sargent; Yale.
3. Overhead Closers: LCN; Norton; Sargent.
4. Door Trim Units: Brookline; BBW.
5. Stops: Baldwin; Ives.
6. Weatherstripping: Pemko; Reese; Zero.
7. Thresholds: Pemko; Reese, Zero.

B. The following hardware has been selected as a standard of quality and design for the scheduled items: Provide proper sizes, quanities, weights and functions to properly equip each door with hardware.

1. Hinges: Stanley FBB Series.
2. Locksets: Sargent 7900 and 8100 Series.
    a. Lever Handle Design: LNE
    b. Knob Design: OB
3. Closers: Sargent 1250 Series.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of glass and glazing work is indicated on drawings.

B. Definitions: "Glass" includes prime glass, processed glass, and fabricated glass products. "Glazing" includes glass installation and materials used to install glass. Types of work in this section include glass and glazing for:

1. Metal frames.
2. Metal doors.
3. Wood doors.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. ALUMINUM WINDOWS: Window Glazing.
B. ALUMINUM DOORS AND FRAMES: Door Glazing.

1.04 QUALITY ASSURANCE:

A. Prime Glass Standards: FS DD-G-451.

B. Heat-Treated Glass Standard: FS DD-G-1403

C. Safety Glass Standard: CPSC 16CFR 1201.

1.05 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications and installation instructions for each type of glass required. Include test data substantiating that glass complies with specified requirements. Submit manufacturer's specifications and installation instructions for each type of glazing sealant, gasket, and associated miscellaneous material required. Include manufacturer's published data, or letter of certification, or certified test laboratory report indicating that each material complies with the requirements and is intended generally for the application shown.

B. Samples: Submit 2, 12" square samples of each type of glass required.

1. Insulating glass samples need not be hermetically sealed, but edge construction must be included.

1.06 DELIVERY, STORAGE AND HANDLING: Protect glass and glazing materials during delivery, storage and handling and comply with manufacturer's directions to prevent edge damage to glass and damage to glass and glazing from moisture, condensation, temperature change and direct exposure to sun.

1.07 JOB CONDITIONS:

A. Pre-Installation: Meet with Glazier and other trades affected by glass installation, prior to beginning of installation. Do not perform work under adverse weather or job conditions. Install liquid sealants when temperatures are within lower or middle third of temperature range recommended by manufacturer.

1.08 SPECIFIED PRODUCT WARRANTY:

A. Warranty on Hermetic Seals: Provide insulating glass manufacturer's written warranty agreeing to, within specified warranty period, furnish FOB project site, replacement units for insulating glass units which have defective hermetic seals (excluding that due to glass breakage); defined to include intrusion of moisture or dirt, internal condensation at temperatures above -20 degrees F (-32 degrees C), deterioration of internal glass coatings, and other visual evidence of seal failure or performance failure; provided manufacturer's instruction for handling, installation, protection and maintenance have been adhered to during warranty period.

B. Warranty period is 10 years after seal date permanently imprinted on unit, but not less than 9 years after date of substantial completion.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one the following:

1. Ford Glass Company
2. Guardian Industries Corp.
3. Libbey-Owens-Ford Company.
4. PPG Industries, Inc.

2.02 GLASS PRODUCTS:

A. Float/Plate Glass: Type 1, Quality q3, clear unless otherwise indicated.

B. Polished Wired Glass: Type III, Kind A, Form 1, Quality q11, clear and polished both faces.

1. Mesh: Type m3, square.
2. Fire Rating: Provide glass listed and labeled by UL for "fire resistance."

2.02 PROCESSED GLASS:

A. Tempered Glass: Provide prime glass of color and type indicated, which has been heat treated to strengthen glass in bending to not less than 4.5 times annealed strength.

1. Provide where indicated or required by law.

2.03 FABRICATED GLASS UNITS:

A. Insulating Glass: Provide 2 sheets of glass as follow, and 1/2" dry air or gas-filled space with -20 degrees F (-29 degrees C) dew point, with Class A sealant-type edge construction to maintain a hermetic seal; fabricated to provide the following overall performance characteristics:

   1. Exterior and Interior Glass: Heat-strengthened clear float glass, Quality q3.
   2. Edge Construction: Twin primary seals of polyisobutylene; tubular aluminum or galvanized steel spacer-bar frame with welded or soldered sealed corners, and filled with desiccant; and secondary seal outside of bar, bonded to both sheets of glass and bar, of polysulfide, silicone or hot-melt butyl elastomeric sealant (fabricator's option).
   3. Warranty: Provide manufacturer's standard 10-year product warranty on maintained hermetic seal.

2.04 GLAZING SEALANTS AND COMPONENTS:

A. General: Provide color of exposed sealant/compound selected by Architect from manufacturer's standard colors, or black if no color is so selected. Comply with manufacturer's recommendations for selection of hardness, depending upon the location of each application, conditions at time of installation, and performance requirements as indicated. Select materials, and variations or modification, carefully for compatibility with surfaces contacted in the installation.

B. 1-Part Acrylic Glazing Sealant: Thermo-plastic solvent-based acrylic terpolymer, complying with FS TT-S-00230, Class B, Type II; solids of 95% acrylic.

C. Preformed Butyl Rubber Glazing Sealant: Compound of polymerized butyl rubber and inert fillers, with or without polyisobutylene modification, solvent-based, 95% solids, formed and coiled on release paper; tack-free in 24 hrs., paintable, nonstaining; plain, preshimmed or reinforced as required for proper installation and setting of glass.

2.04 MISCELLANEOUS GLAZING MATERIALS:

A. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

B. Setting Blocks: Neoprene of EPDM, 70-90 durometer hardness, with proven compatibility with sealants used.

C. Spacers: Neoprene of EPDM, 40-50 durometer hardness with proven compatibility with sealants used.

D. Compressible Filler (Rod): Closed-cell or waterproof-jacketed rod stock or synthetic rubber or plastic foam, proven to be compatible with sealants used, flexible and resilient, with 5-10 psi compression strength for 25% deflection.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which glass and glazing work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 STANDARDS AND PERFORMANCE:

A. Watertight and airtight installation of each glass product is required. Each installation must withstand normal temperature changes, wind loading, impact loading (for operating sash and doors), without failure including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials and other defects in the work.

B. Protect glass from edge damage during handling and installation, and subsequent operation of glazed components of the work. During installation, discard units with significant edge damage or other imperfections.

C. Glazing channel dimensions as shown are intended to provide for necessary bite on glass, minimum edge clearance, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by job conditions at time of installation.

D. Comply with combined recommendations and technical reports by manufacturers of glass with glazing products as used in each glazing channel, and with recommendations of Flat Glass Marketing Association "Glazing Manual," except where more stringent requirements are indicated.

E. Install insulating glass units to comply with recommendations by Sealed Insulating Glass Manufacturers Association, except as otherwise specifically indicated or recommended by glass and sealant manufacturers.

3.03 PREPARATION FOR GLAZING:

A. Clean glazing channel and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrate. Remove lacquer from metal surfaces where elastomeric sealants are used.

B. Apply primer or sealant to joint surfaces where recommended by sealant manufacturer.

3.04 GLAZING:

A. Install setting blocks of proper size in sill rabbet, located 1/4th of glass width from each corner. Set blocks in thin course of heel-bead compound, if any.

B. Provide spacers inside and out, of proper size and spacing, for glass sizes larger than 50 united inches, except where gaskets or preshimmed tapes are used for glazing. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.

C. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.

D. Voids and Filler Rods: Prevent exudation of sealant or compound by forming voids or installing filler rods in channel at heel of jambs and head (do not leave voids in sill channels), except as otherwise indicated and depending on light size, thickness and type of glass, and complying with manufacturer's recommendations.

E. Force sealants into channel to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.

F. Tool exposed surfaces of glazing liquids and compounds to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.

G. Clean and trim excess glazing materials from glass and stops of frames promptly after installation, and eliminate stains and discolorations.

3.05 PROTECTION AND CLEANING:

A. Protect exterior glass from breakage immediately upon installation, by use of crossed streamers attached to framing and held away from glass. Do not apply markers to surfaces of glass. Remove nonpermanent labels and clean surfaces of glass. Cure sealants for high early strength and durability.

B. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.

C. Wash and polish glass on both faces not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Comply with glass product manufacturer's recommendations for final cleaning.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements apply to the work of this Section.

1.02 DESCRIPTION OF WORK:

A. Extent of the gypsum drywall work is shown on the drawings and in schedules, and is hereby defined to include gypsum board work with a tape-and-compound joint treatment system known as "drywall finishing" work.

B. Types of work required include the following:

1. Gypsum drywall including screw-type metal support systems.
2. Gypsum board for application of other finishes.
3. Drywall finishing (joint tape-and-compound treatment).
4. Exterior sheathing.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. COLD FORMED METAL FRAMING: Loading bearing metal studs.
B. TILE: Backerboard for tile finish.

1.04 QUALITY ASSURANCE:

A. Fire-Resistance Rating: Where work is indicated for fire-resistance ratings, including those required to comply with governing regulations, provide materials and installations identical with applicable assemblies which have been tested and listed by recognized authorities, including Underwriter's Laboratories and American Insurance Association.

B. Gypsum Board Terminology Standard: GA-505 BY Gypsum Association

C. Allowable Tolerances: 1/8" offsets between planes of board faces, and 1/4" in 8'-0" for plumb, level, warp and bow.

D. Manufacturer: Obtain gypsum boards, metal framing, trim accessories, adhesives and joint treatment products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum boards.

1.05 SUBMITTALS: Submit 2 copies of manufacturer's product specifications and installation instructions for each gypsum drywall component, including other data as may be required to show compliance with these specifications.

1.06 PRODUCT HANDLING: Deliver gypsum drywall materials in sealed containers and bundles, fully identified with manufacturer's name, brand, type and grade; store in a dry, well ventilated space, protected from the weather, under cover and off the ground.

1.07 JOB CONDITIONS: Maintain ambient temperatures at not less than 55 degrees F, for the period of 24 hours before drywall finishing, during installation and until compounds are dry.

PART 2 PRODUCTS

2.01 MANUFACTURERS:

A. Manufacturers offering products complying with requirements for gypsum drywall include the following:

1. Georgia-Pacific Corp.
2. Gold Bond Bldg. Products
3. U.S. Gypsum Co.

2.02 METAL SUPPORT MATERIALS:

A. Ceiling Support:

1. General: Size components per ASTM C 754.
2. Hanger Wire: ASTM A 641, soft, Class 1 galvanized.
3. Hanger Anchorage Devices: Devices applicable to indicated method of anchorage proven through standard construction practice or by certified test data. Size devices for 3 x calculated load supported except size direct pull-out concrete inserts for 5 x calculated loads.
4. Direct Suspension Systems: Manufacturer's standard zinc-coated or painted steel system of runners, furring tees, and accessories designed for concealed support of gypsum drywall ceilings.

B. Wall/Partition Support:

1. Studs: ASTM C 645; 25 gage x 3-5/8" deep, except where otherwise indicated:
    a. Runners: Match studs; type recommended by stud manufacturer for floor and ceiling support of studs, and for vertical abutment of drywall work at other work.
    b. Stud System Accessories: Provide stud manufacturer's standard clips, shoes, ties, reinforcements, fasteners and other accessories as needed for a complete stud system.

2. Furring Members: ASTM C 645; 25 gage, hat shaped, resilient type designed to reduce sound transmission.
3. Z-Furring Members: Zee-shaped, screw-type, not thinner than 26 gage, galvanized steel, ASTM A 525, G90; depth indicated; designed for mechanical attachment of insulation to wall.
4. Fasteners for Furring Members: Type and size recommended by furring manufacturer for substrate and application indicated.
5. Shaftwall Framing: Manufacturer's standard shapes per ASTM A 446, Grade A or B and ASTM 525 G-60 (for galvanized finish.)

2.03 GYPSUM BOARD PRODUCTS:

A. Gypsum Wallboard: ASTM C 36, in maximum lengths available.

1. Type: Regular, unless otherwise indicated.
2. Type: Foil-backed at exterior walls and ceilings.
3. Type: Type X for fire-resistance rated assemblies.
4. Edges: Tapered.
5. Thickness: As indicated.

B. Gypsum Backing Board: ASTM C 442 or, where backing board is not available, gypsum wallboard, ASTM C 36.

1. Type: Regular, unless otherwise indicated.
2. Type: Foil-backed at exterior walls and ceilings.
3. Type: Type X for fire-resistance rated assemblies.
4. Edges: Manufacturer's standard.
5. Thickness: As indicated.

C. Water-Resistant Backing Board: ASTM C 630, with tapered edges and of type and thickness indicated; in maximum lengths to minimize end-to-end butt joints.

1. Type: Regular, unless otherwise indicated.
2. Type: Type X for fire-resistant rated assemblies and where indicated.
3. Thickness: As indicated.

D. Shaftwall Board: Standard gypsum coreboard or backing board designed for shaftwall construction, complying with ASTM 442, Type X; moisture resistant facings, maximum lengths and thicknesses indicated.

E. Gypsum Sheathing Board: Comply with FS SS-L-30, Type II (sheathing), Class 2 (water-resistant surfaces), Form a (plain back), Grade (core) and Style indicated and with ASTM C 79.

1. Grade W: Water-resistant core.
2. Grade X: Fire-resistant core; where indicated.
3. Style: V-tongue and groove long edges, square ends.
4. Size: 2'-0" x 8'-0".

2.04 TRIM ACCESSORIES;

A. General: Provide manufacturer's standard laminated metal and joint tape corner reinforcement, designed to provide a concealed metal corner bead and to be bedded same as regular joint tape.

B. Finishing Type: Manufacturer's standard trim units which are to be finished with joint compound.

2.05 JOINT TREATMENT MATERIALS:

A. General: ASTM C 475; type recommended by the manufacturer for the application indicated, except as otherwise indicated.

B. Joint Tape: Perforated type.

C. Joint Compound: On interior work provide chemical-hardening-type for bedding and filling, ready-mixed vinyl-type or non-casein-type for topping.

D. Water-Resistant Joint Compound: Special water-resistant type for treatment of joints, fastener heads and cut-edges in water-resistant board.

2.06 MISCELLANEOUS MATERIALS:

A. General: Provide auxiliary materials for gypsum drywall work of the type and grade recommended by the manufacturer of the gypsum board.

B. Gypsum Board Screws: Comply with ASTM C 646.

C. Concealed Acoustical Sealant: Mastic type, non-shrinking, non-drying, non-migrating and non-staining.

D. Exposed Acoustical Sealant: Latex, acrylic, or acrylic-latex type; permanently elastic and paintable.

E. Sound Attenuation Blankets: FS HH-I-251, Type 1; semi-rigid mineral fiber blanket without membrane, Class 25 flame spread, thickness as indicated.

F. Water-Resistant Sealant: Type recommended by gypsum board manufacturer for sealing cut edges and holes in water-resistant gypsum board.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which the work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 INSTALLATION OF METAL SUPPORT SYSTEMS:

A. General: Comply with ASTM C 754 as applicable.

1. Do not bridge building expansion joints with support system, frame both sides of joints as indicated.

B. Ceiling Support Suspension:

1. Secure hangers by connecting directly to structure where possible, otherwise connect to inserts, as indicated.
2. Space main runners 4'-0" o.c. and space hangers 4'-0" o.c. along runners.
3. Level main runners to a tolerance of 1/4" in 12'-0", measured both lengthwise and transversely.
4. Direct-hung System: Attach perimeter wall track or angle wherever support system meets vertical surfaces. Mechanically join support members to each other and to wall track.

5. Install auxilliary framing as required for support of other work.

C. Wall/Partition Support:

1. Install supplementary framing, blocking and bracing to support fixtures, equipment, services, heavy trim, furnishings and similar work which cannot be adequately supported on gypsum board alone.
2. Isolate stud system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading. Comply with details.
3. Anchor ends of horizontal stiffeners where system abuts structural columns or walls.
4. Install runner tracks at floors, ceilings and structural walls and columns where gypsum drywall stud system abuts other work.
5. Extend partition stud system through acoustical ceilings and elsewhere as indicated to the structural support of substrate above the ceilings.
6. Space studs 16" o.c., except as otherwise indicated.
7. Fasten studs at ends of floor and ceiling runner tracks by installing a screw into both flanges at each end.
8. Secure jamb studs to frames of openings with screws, wire-ties or welds either directly to frames or to special frame-support brackets; and install runner track sections (for jack studs) above and below openings, secure to jamb studs.
   a. Space jack studs same as partition studs, and screw to runner tracks above and below.
   b. Install 2 studs at each jamb of each opening over 2'0" wide, except as otherwise indicated.
   c. Install horizontal stiffeners 6" above and 6" below each opening more than 3'-0" wide, and extend 2 regular stud spaces beyond each jamb.

9. Space furring members 16" o.c.
10. Erect Z-furring members vertically to hold thermal insulation 24" o.c. Securely attach flanges to wall with fasteners 24" o.c. Hold insulation in place with 10" staples of 18 gage wire inserted in web of members until gypsum board is installed.

3.03 INSTALLATION OF GYPSUM BOARD:

A. Pre-Installation Conference: Prior to the start of installation of gypsum board meet at the project site with the installers of related work. Review areas of potential interference and conflicts, and coordinate layout and sequencing requirements for proper integration of the work.

1. Do not proceed with gypsum board installation until blocking, framing, bracing and other supports for subsequently applied work have been installed.
2. Do not install gypsum board until thermal insulation and vapor barrier to be concealed by board has been installed.

3. Install sound attenuation blankets where indicated and where required to achieve STC ratings or fire-resistance ratings, before installation of gypsum board.

B. General Installation Requirements:

1. Standards: Comply with "ASTM C 840 and GA-216 and with requirements for indicated fire-resistance ratings.
2. Locate exposed end-butt joints as far from center of walls and ceilings as possible, and stagger not less than 1'-0" in alternate courses of board.
3. Install exposed gypsum board with face side out. Do not install imperfect damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16" open space between boards. Do not force into place.
4. Locate either edge or end joints over supports, except in horizontal applications or where intermediate supports or gypsum board back-blocking is provided behind end joints. Position boards so that both tapered edge joints abut, and mill-cut or field-cut end joints abut. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions.
5. Attach gypsum board to framing and blocking as required for additional support at openings and cutouts.
6. Cutting: After scoring face paper and breaking core, cut back paper; do not tear or snap.
7. Form control joints in drywall construction as recommended. Allow 1/2" continuous opening between edges of adjacent boards to allow for insertion of control joint trim accessory.
   a. Maximum distance: Vertical - 30 ft., Horizontal - 50 ft.
8. Do not locate joints within 8" of corners of openings, except where control joints are shown at jamb lines or where openings occur adjacent to corners in the partition/wall layout. Where necessary, place a single vertical joint over the center of wide openings.
9. Install gypsum board on both faces of steel stud partition framing above ceilings and in similar concealed spaces, except in chase walls which are properly braced internally.
   a. Where a partition in concealed spaces is not required for STC rating, fire-resistance rating, or control of air distribution, smoke or heat, studs may be faced with scrapes of gypsum board applied in a single layer. Apply each piece with 2 or more screws in each stud, 12" maximum screw spacing. Cover at least 75% of each face.
10. Provide perimeter isolation where non-load-bearing partitions abut structural decks or ceilings, or vertical structural elements. Allow not less than 1/4", nor more than 1/2" gap between gypsum and structure. Finish edges of face layer with J-type (semi-finishing) casing bead. Seal space between casing bead and structure with continuous acoustical sealant bead. Attach gypsum board to studs not less than 1/2" below bottom edge of ceiling rack flanges and to first stud adjacent to vertical tracks. Do not attach board directly to tracks.
11. Where sound-rated drywall work is indicated (STC rating), seal

work at perimeters, joints and penetrations with continuous bead of acoustical sealant including bead at both faces of partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of beads, and close off soundflanking paths around or through work, including sealing of partitions above acoustical ceilings.

12. Space fasteners in gypsum boards in accordance with referenced standards and manufacturer's recommendations.

C. Methods of Gypsum Drywall Installation:

1. General: In addition to compliance with the standards, comply with the specific requirements indicated for each type or arrangement of gypsum drywall system shown. Otherwise, options permitted by the standards, including manufacturer's recommendations, are Installer's option.
2. On ceilings apply gypsum board prior to wall/partition board with screws.
3. Single-Layer Walls and Partitions: Install exposed gypsum board in the manner indicated:
    a. Apply sheets vertically and provide sheet lengths which will minimize end joints.
    b. For parallel applications, locate edge joints over supports; for right-angle applications, stagger end joints over supports.
    c. Fasten with screws.
4. Double-Layer Walls and Partitions: Install base layer of gypsum backing board and face layer of exposed gypsum board. Apply both layers vertically, with joints of base layer over supports and joints of face layer offset at least 10" with base layer joints. Provide sheet lengths which will minimize end joints in face layer.
    a. Fasten base and face layer with screws into supports.
5. Drywall Shaft Systems: Comply with manufacturer's installation instructions, performance requirements and governing codes.

3.04 INSTALLATION OF DRYWALL TRIM ACCESSORIES:

A. General: Coordinate, and integrate where possible, the installation of trim accessories with the installation of gypsum board. Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to the supports. Otherwise, fasten flanges by nailing or straping in accordance with manufacturer's instructions and recommendations.

1. Install metal corner tape at external corners of drywall work.
2. Install metal edge trim wherever edge of gypsum board would otherwise be exposed or semi-exposed. Provide type with face flange to receive joint compound except where semi-finishing type is indicated. Install L-type trim where work is tightly abutted to other work. Install U-type trim where edge is exposed, revealed, gasketed, or sealant filled (including expansion joints).
3. Install control joint bead units where control joints are

indicated. If not indicated, space maximum 30 ft. apart.

4. Miter corners of exposed molding and trim units. Align joints and support to eliminate off-sets.

3.05 INSTALLATION OF DRYWALL FINISHING:

A. General: Comply with manufacturer's instructions for the mixing, handling and application of materials. Machine or hand application is Installer's option. Apply treatment at joints both directions, flanges of trim accessories (but not semi-finishing types), penetrations of the gypsum board (electrical boxes, piping and similar work), fastener heads, surface defects and elsewhere as indicated; and apply in the manner which will result in each of these being concealed when applied decoration has been completed.

1. Apply joint tape at joints between gypsum boards, except where a trim accessory is indicated.
2. Do not use topping compound for bedding the joint tape.
3. Apply joint compound in 3 coats (not including prefill of openings in base), and sand between last 2 coats and after last coat.
4. Do not use bedding compound for the final coat of joint treatment, unless specifically recommended by the manufacturer for that use.

B. Install metal corner tape in lieu of joint tape at diagonal and non-right-angle internal corners in the work.

C. Partial Finishing: Omit drywall finishing only where specifically indicated as "unfinished". Omit third (topping) coat of compound and omit sanding where indicated for partial finish and where work is concealed, including partition/wall/ceiling surfaces above suspended ceilings where work is indicated for fire-resistance, smoke barrier, sound attenuation, HVAC plenum or similar purposes.

3.06 INSTALLATION OF EXTERIOR SHEATHING: Install 2' x 8' sheating horizontally with long edges at right angles to studs with grooved edge down. Center and joints over supports and stagger in each course. Screw to each support with manufacturer's recommended spacing, but provide not less than 4 fasteners per 2' width per stud. Keep perimeter fasteners 3/8" from edges and ends of units. Fit tightly against each other and openings.

3.07 PROTECTION OF FINISHED WORK: Provide final protection and maintain conditions, in a manner suitable to ensure gypsum drywall work being without damage or deterioration at time of substantial completion.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENT: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Definitions: Tile includes ceramic surfacing units made from clay or other ceramic materials.

B. Extent of tile work is indicated on drawings and schedules.

C. Types of tile work included in this section include:

1. Ceramic mosaic tile.
2. Unglazed paver tile.

D. Sealing joints in tile work with joint sealers is work of this section.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. TOILET ACCESSORIES.

1.04 QUALITY ASSURANCE: Provide materials obtained from one source for each type and color of tile, grout, and setting materials.

1.05 SUBMITTALS:

A. Product Data: Submit manufacturer's technical information and installation instructions for materials required, except bulk materials.

B. Samples for Initial Selection Purposes: Submit manufacturer's color charts consisting of actual tiles or sections of tile showing full range of colors, textures and patterns available for each type of tile indicated. Include samples of grout and accessories involving color selection.

C. Samples for Verification Purposes: Submit the following:

1. Samples for each type of tile and for each color and texture required, not less than 12" square, on plywood or hardboard backing and grouted.

D. Certification: Furnish Master Grade Certificate for each type of tile, signed by manufacturer and Installer.

1.06 PRODUCT HANDLING: Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Prevent damage or contamination to materials by water, freezing, foreign matter or other causes.

1.07 PROJECT CONDITIONS:

A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

B. Vent Temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.

C. Maintain Temperatures at not less than 50 degrees F (10 degrees C) in tiled areas during installation and for 7 days after completion, unless higher temperatures required by referenced installation standard or manufacturer's instructions.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following manufacturers:

1. Tile:
    a. American Olean Tile Co., Inc.
    b. Dal-Tile Corp.
    c. United States Ceramic Tile Co.
2. Adhesives and Mortar:
    a. American Olean Tile Co., Inc.
    b. L & M Surco Mfg., Inc.
    c. The Upco Company
3. Tile Cleaners:
    a. Hillyard Chemical Co.
    b. L & M Surco Mfg. Co., Inc.

2.02 PRODUCTS, GENERAL:

A. ANSI Standard for Ceramic Tile: Comply with ANSI A137.1 "American National Standard Specifications for Ceramic Tile" for types and grades of tile indicated.

1. Furnish tile complying with "Standard Grade: requirements unless otherwise indicated.

B. ANSI Standard for Tile Installation Materials: Comply with ANSI standard referenced with installation products and materials indicated.

C. Colors, Textures and Patterns: For tile and other products requiring selection of colors, surface textures or other appearance characteristics, provide products to match characteristics indicated or as selected by Architect from manufacturer's standards.

1. Provide tile trim and accessories which match color and finish of adjoining flat tile.

D. Mounting: Where factory-mounted tile is required provide back-or edge-mounted tile assemblies as standard with manufacturer.

2.03 TILE PRODUCTS:

A. Unglazed Ceramic Mosaic Tile: Factory mounted flat tile as follows:

1. Type: Porcelain with abrasive admixture.
2. Nominal Facial Dimensions: 1" x 2" and 2" x 2" as selected.
3. Nominal Thickness 1/4"
4. Face: Plain with cushion edge.

B. Unglazed Paver Tile: Provide flat tile complying with following requirements:

1. Type: Porcelain.
2. Nominal Facial Dimensions: 8"x 8".
3. Face: Plain with cushion edges.

C. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with following requirements:

1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile, where applicable.
2. Shapes: As follows, selected from manufacturer's standard shapes:
   a. Base for Thinset Mortar Installations: Straight.
   b. External Corners for Thinset Installations: Surface bullnose.
   c. Internal Corners: Field-butted square corners, except use internal cove and cap angle pieces designed to member with stretcher shapes.

2.04 SETTING MATERIALS:

A. Thin Set Portland Cement Mortar: Where thin-set portland cement mortar applications are indicated use dry-set portland cement mortar, ANSI A118.1, factory sanded; or latex-portland cement mortar, ANSI A118.4.

2.05 GROUTING MATERIALS:

A. Latex-Portland Cement Grout: Provide product complying with ANSI A118.6; manufacturer's standard latex additive (water emulsion) serving as a replacement for part or all of gauging water, added at job site to prepackaged dry grout mix; color selected by Architect.

2.06 MISCELLANEOUS MATERIALS:

A. Mildew Resistant Silicone Sealant: Comply with ASTM C 920, Type S, Grade NS; Class 25; Uses NT, G, A and as applicable to non-porous joint substrates indicated; formulated with fungicide for sealing interior joints around ceramic tile and plumbing fixtures.

B. Metal Edge Strips: Zinc alloy or stainless steel, 1/8" wide at top edge with integral provision for anchorage to substrate.

C. Tile Cleaner: Product specifically acceptable to manufacturer of tile and grout manufacturer for application indicated and as recommended by National Tile Promotion Federation or Ceramic Tile Institute.

PART 3 EXECUTION

3.01 INSPECTION: Examine surfaces to receive tile work and conditions under which tile will be installed. Do not proceed with tile work until surfaces and conditions comply with requirements indicated in referenced tile installation standard.

3.02 INSTALLATION GENERAL:

A. ANSI Tile Installation Standard: Comply with applicable parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile".

B. TCA Installation Guidelines: TCA "Handbook for Ceramic Tile Installation"; comply with TCA installation methods indicated or, if not otherwise indicated, as applicable to installation conditions shown.

C. Extend tile work into recesses and under or behind equipment and fixtures, to form a complete covering without interruptions, except as otherwise shown. Terminate work neatly at obstructions, edges and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures and other penetrations so that plates, collars, or covers overlap tile.

E. Jointing Pattern: Unless otherwise shown, lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are same size. Layout tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise shown.

1. For tile mounted in sheets make joints between tile sheets same width as joints within tile sheets so that extent of each sheet is not apparent in finished work.

F. Seal Joints between tilework and plumbing fixtures with silicone sealant in accordance with manufacturer's instructions.

G. Grout tile to comply with referenced installation standards, using grout materials indicated.

1. Mix and install proprietary components to comply with grout manufacturer's directions.

3.03 FLOOR INSTALLATION METHODS:

A. Ceramic Mosaic and Paver Tile: Install to comply with requirements indicated below for setting bed methods, TCA installation methods related to types of subfloor construction and grout types:

1. Thin-Set Portland Cement Mortar: ANSI A108.5.
    a. Concrete Subfloors, Interior: TCA F113.
    b. Grout: Latex-portland cement.

3.04 CLEANING AND PROTECTION

A. Cleaning: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's printed instructions, but not sooner than 14 days after installation. Protect metal surfaces, cast iron and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, or otherwise defective tile work.

C. Protection: When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to complete tile wall and floors. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent staining, damage and wear.

1. Prohibit foot and wheel traffic from using tiled floors for a least 7 days after grouting is completed.
2. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1, General Requirements, apply to work of this section.

1.02 QUALITY CONTROL:

A. Panel Manufacturer: Provide acoustical panel units manufactured by one of the following:

1. Celotex Corp.
2. Conwed Corp.
3. Gold Bond Bldg. Products Div.

B. Suspension System Manufacturer: Same as panel manufacturer.

C. Subcontract the installation of acoustical panels to an experienced installation firm which is acceptable to the manufacturer of the acoustical panels, as shown by current written statement from the manufacturer.

D. Subcontract the installation of the suspension system to the same firm engaged for the installation of acoustical panels.

E. UL-Rated Assemblies: Where acoustical ceilings are components of floor, roof or beam assemblies indicated for a fire-resistance rating, including those required for compliance with governing regalations, provide panels and application or suspension bearing the UL Classification Marking for the applicable UL design number listed in the UL " Fire Resistance Index". Where required by applicable UL design, provide protection materials for fixtures and ducts.

1. Provide complying UL acoustical panels to match panels in adjacent non-fire-rated acoustical ceiling assemblies.

F. UL Fire Hazard Classification: Provide panels which have been tested, rated and labeled by UL for the indicated ratings as listed in the "Classified Building Materials, Index" by UL.

1. Classification: Maximums of 25 for flame spread, 25 for fuel contributed, and 25 for smoke developed (Class 25).

G. Light Reflectance Ratings: Except as otherwise indicated, provide factory-finished acoustical panels which have been tested by a recognized testing laboratory, in accordance with the procedures of ASTM C 523, to show a light reflectance rating of not less than the required rating indicated.

1. Light Reflectance: Not less than 0.75

H. Noise Reduction Coefficient (NRC): The average of sound absorption coefficients (tested in accordance with ASTM C 423). Provide not less than the required NRC rating indicated.

1. NRC Rating: Range of 0.50 - 0.60.

J. Sound Transmission Class (STC): A single-figure rating for sound transmission loss through the acoustical panel ceiling, determined in accordance with ASTM E 90 and ASTM E 413, and reported as a 5-Db range. Provide not less than the required STC class indicated.

1. STC Class: Range of 35-39, for mounting No. 7.

1.03 SUBMITTALS:

A. Manufacturer's Data:

1. Submit manufacturer's project specifications and installation instructions for type of acoustical panel required, and for suspension system, including certified laboratory test reports and other data as required to show compliance with these specifications.
2. Include manufacturer's recommendations for cleaning and refinishing acoustical panels, including precautions against materials and methods which may be detrimental to finishes and acoustical performances.

B. Samples:

1. Submit 3 sets of 12" square samples for type of acoustical panel required. In each set of samples show the full range of exposed color and texture to be expected in the complete work.
2. Submit 3, 12" long samples of each exposed runner and molding.

C. Maintenance Stock: When installation is completed, deliver stock of maintenance material to Owner. Furnish full size units matching the units installed, packaged with protective covering for storage and indentified with appropriate labels.

1. Furnish an amount of panel equal to 1.0% of the amount installed.

1.04 PRODUCT HANDLING:

A. Deliver acoustical panels in manufacturer's original unopened packages, fully identified with type, finish, performance data and compliance lables. Handle and store in accordance with manufacturer's instructions and recommendations.

1.05 JOB CONDITIONS:

A. Space Enclosure: Do not install interior acoustical panel ceilings until space has been enclosed and is weather-tight, and until work above ceilings has been completed, and until ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

PART 2 PRODUCTS

2.01 ACOUSTICAL PANELS:

A. Factory-Finished Composition-Fiber Acoustical Panels:

1. General: Provide units of the composition, patterns, finishes, sizes, thicknesses, edge profiles and other characteristics as indicated or, if not otherwise indicated (and where more than one option is indicated), provide manufacturer's standard product recommended by the manufacturer for the indicated application.
2. Mineral Fiber Acoustical Panels: Rigid board of mineral fiber wet-felted or molded with binders an fillers.
    a. Density: Where indicated and where necessary for compliance with requirements provide "High-Density" panels with a minimum density of 17 lbs. per cu./ ft.; otherwise, provide manufacturer's standard density, but not less than 10 lbs. per cu. ft. density.
    b. Binders: Manufacturer;s standard binder as recommended for the application indicated, except provide panel with inorganic binders where shown for a " high-Humidity" area.
3. Pattern:
    a. Standard Mineral Fiber Panels: Rough Texture with perforations, NRC 50, LR 1 04 2 (0.75 or 0.70), Stc 30-34, white, 24" x 24" x 3/4".
    b. High Density Panels: Finely perforated pattern, NRC 55, LR 1 (0.75), STC 40-44, white, 24" x 24" x 5/8".
4. Finish:
    a. Standard Mineral Fiber Panels: Washable white paint.
    b. High Density Panels: Manufacturer's special scrubbable finish.
5. Sizes: Refer to reflected ceiling plans or drawings.
6. Thickness: Manufacturer's standard thickness for the type of panel, and for size and application indicated.
7. Edge Profile: Manufacturer's standard recessed or revealed edge profile.
8. Sag Resistance: Provide panels which have been tested and certified by the manufacturer for maximum or 1/4 inch sag at 90 degrees F. and 70% relative humidity; in accordance with AIMA : Test Procedure for Sag Resistance of Ceiling Panels".
    a. High-Humidity: Where indicated for "High-Humidity" area of building, test and certify panels as specified above, except test at 90% relative humidity.

B. Manufacturer: Subject to compliance with requirements provide one of the following:

1. FISSURETONE; Celotex Corp.
2. NATURAL FISSURED; Conwed Corp.
3. SOLITUDE; Gold Bond Bldg. prod. Div.

2.02 SUSPENSION SYSTEM MATERIALS:

A. Standard: Comply with the requirements of ASTM C 635, as applicable to the suspended acoustical panel ceilings system materials indicated.

1. Structural Classification: Medium-duty system.

B. Coordination of Components: Provide suspension system which is coordinated with the indicated limitations and requirements for hanging from structure and supporting light fixtures, HVAC components and similar work indicated to be supported by or located in suspended acoustical panel ceilings. Include the necessary components for a complete suspension system including (as applicable) inserts, anchors, hangers, carrying channels, main runners, cross runners, splines, edge moldings, splices, clips, fasteners, springs, tie wires, hold-down devices, and similar members, devices and accessories.

C. Corrosion Protection: Provide finishes as indicated, but in no case less than required by ASTM C 635 for normal use environments.

1. High-Humidity Finishes: Where suspension system supports ceiling where interior is indicated as a "High-Humidity" area of project comply with ASTM C 635 requirements for "Severe Environment Performance" for the "High-Humidity Test".

D. Attachment Devices: Type recommended by suspension system manufacturer for attachment or anchorage of ceiling hangers to structure above ceiling, sized for not less than 5-times the hanger design load for the structural classification indicated; ASTM C 635, Table 1, Direct Hung.

E. Hanger Wire: Galvanized carbon steel wire, ASTM A 641, soft temper, prestretches, Class 1, coating.

1. Gage: Provide wire sized so that stress at 3-times hanger design load(ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than 12 gage (0.106") wire.

F. Access Through Ceiling: Where lay-in panel system is indicated or required to be equipped with hold-down devices, provide mean for total access for ceiling plenum through removal of each panel independently. Provide either self-release spring-type devices or special tool-activated devices (and furnish tool).

G. Runners, Cross Runners and Edge Moldings:

1. General: Except as otherwise indicated, provide manufacturer's standard units of the metal, finish and shapes recommended for the applications indicated.

H. Type of System: Direct-hung suspension system.

J. Exposure of System: Provide fully-exposed suspension system (for lay-in panels), with lower flanges of both main runners and cross runners exposed.

K. Finish of Exposed Members: Provide uniform factory-applied finish on exposed surfaces of ceiling suspension system including moldings, trim and accessories.

   1. Finish: Manufacturer's standard baked enamel finish, white unless otherwise selected by Architect.

L. Suspension System Manufacturer: Same as panel manufacturer.

2.03 MISCELLANEOUS MATERIALS:

A. Edge-Trim Molding: Metal or extruded PVC plastic, of the types and profiles indicated, white finish unless otherwise indicated.

B. Acoustical Sealant: A heavy-bodied, non-shrinking, non-drying, non-sag grade mastic compound intended for interior sealing of concealed construction joints.

PART 3 EXECUTION

3.01 INSPECTION AND PREPARATION WORK:

A. Examine the conditions under which the acoustical panel ceiling work is to be performed. Do not proceed with the work until satisfactory conditions have been corrected in an acceptable manner.

B. Pre-Installation Conference: Prior to the start of acoustical ceiling installation, meet at the project site with the installers of related work, including lighting, ductwork and similar work in the ceiling plenum. Review areas of potential interference and resolve conflicts before proceeding with the work. Coordinate ceiling layout with the layout of other work which penetrates or is supported by the ceiling in each space of the building.

3.02 INSTALLATION:

A. General:

   1. Codes and Standards: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations, fire resistance rating requirements as indicated, and industry standards applicable to the work.
   2. Orient each unit of directionally-patterned panels in the same direction to produce a uniform direction of pattern.

B. Suspended Ceiling Installation:

   1. General: Comply with the ASTM C 636 as applicable to acoustical panel ceilings, except to the extent more stringent requirements are indicated or required for compliance with governing

regulations or fire resistance ratings.

C. Suspend ceiling hangers from building structural members only, and only as indicated.

   1. Space hangers not more than 4'0" o.c. along each member supported directly from hangers, unless otherwise shown, and provide a hanger not more than 6" from ends of each member.

D. Cope exposed flanges of intersecting members so that flange faces will be flush (copy flange of member supported by flange of other member).

E. Install edge moldings of the type indicated at edges of each acoustical panel ceiling area, and at locations where edge of panel would otherwise be exposed after completion of the work.

   1. Sealant Bed: Apply continuous ribbon of acoustical sealant on back of vertical leg before fastening to vertical surface. Locate so that sealant will not be exposed after installation is completed.
   2. Secure moldings to building construction by fastening through holes drilled in vertical leg. Space holes not more than 3" from each end and not more than 16" o.c., between end holes. Draw-up fasteners for tight set against vertical surfaces.
      a. Masonry: Fasten with wood or machine screws into lead shield type anchors drilled into construction.
      b. Hollow Masonry or Stud Construction: Fasten with toggle bolts or similar self-expanding screw anchors.
   3. Miter corners of moldings accurately to provide hair-line joints.
   4. Level moldings with ceiling suspension system, to a level tolerance of 1/8" in 12'-0".

F. Install acoustical panels in coordination with suspension system.

   1. Install hold-down clips in areas indicated and required by governing regulations or by fire-resistance ratings; space as recommended by panel manufacturer, unless otherwise required.
   2. Install impact springs in areas indicated.
   3. Scribe and cut panels for accurate fit at borders and at interruptions and penetrations by other work through the ceilings.

3.03 CLEANING AND PROTECTION

A. Clean exposed surfaces of acoustical panels and of trim, edge moldings and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

B. Provide required protection for the acoustical panel ceilings, including temperature and humidity limitations and dust control, so that the work will be without damage and deterioration at the time of acceptance by the Owner.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements apply to the work of this Section.

1.02 DESCRIPTION OF WORK:

A. Extent of resilient flooring and accessories is shown on the drawings and in schedules.

B. Types of resilient flooring required are:
  1. Vinyl composition tile.
  2. Sheet vinyl.

C. Types of accessories required are:
  1. Wall base.
  2. Stair treads.
  3. Edge strips.

1.03 QUALITY ASSURANCE:

A. MANUFACTURER: Provide each type of resilient flooring and accessories as produced by a single manufacturer: including recommended primers, adhesives, sealants and leveling compounds.

1.04 SUBMITTALS

A. Product Data: Submit 2 copies of manufacturer's technical data and installation instructions for each type of resilient flooring and accessory.

B. Samples: Submit 3 sets of samples of each type, color and finish of resilient flooring and accessory required. Provide full-size tile units and 12" square samples of sheet flooring and 6" long samples of accessory. Include full range of flooring color and pattern variation.

C. Maintenance Instructions; Resilient Flooring: Submit manufacturer's written instructions for recommended maintenance practices.

1.05 JOB CONDITIONS

A. Continuously heat areas to receive flooring to 70 degrees F. for at least 48 hours prior to installation, when project conditions are such that heating is required. Maintain 70 degrees F. temperature continuously during and after installation as recommended by flooring manufacturer, but for not less than 48 hours.

PART 2 - PRODUCTS

2.01 COLORS AND PATTERNS:

A. Provide colors and patterns as selected by Architect from manufacturer's standards.

2.02 VINYL COMPOSITION TILE: FS SS-T-312, Type IV; 12" x 12" x 1/8"; Composition 1, asbestos free.

2.03 VINYL SHEET FLOORING: Vinyl sheet with filled vinyl plastic wear layer and fibrous backing complying with FS L-F-475, Type II, Grade A requirements with manufacturer's recommended static load of 100 psi, and 72" min. sheet width; wearing surface of min. .050" thick, total thickness min. .085.

2.04 ACCESSORIES:

A. Resilient Base: Provide vinyl base complying with FS SS-W-40, Type II, with matching end stops and preformed or molded corner units, as follows:

1. Height: 4".
2. Thickness: 0.080" gage.
3. Style: Standard top-set cove.

B. Resilient Stair Treads: Single piece units for width of stair treads, vinyl type complying with FS RR-T-650, Type B, sanded backs, Class 1 round nose; not less than 3/16" thick nominal and 1/4" at nosing.

C. Resilient Edge Strips: 1/8" thick, homogenous vinyl or rubber composition, tapered or bullnose edge, color as selected by Architect from standard colors available; not less than 1" wide.

D. Adhesives (Cements): As recommended by flooring manufacturer to suit material and substrate conditions.

E. Leveling and Patching Compounds: Latex types recommended by flooring manufacturer.

PART 3 - EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which resilient flooring and accessories are to be installed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 PREPARATION:

A. Prior to laying flooring, broom clean or vacuum surfaces to be covered and inspect subfloor. Start of flooring installation indicates acceptance of subfloor conditions and full responsibility for completed work.

1. Use leveling compound as recommended by flooring manufacturer for filling small cracks and depressions in subfloors.
2. Remove coatings from subfloor surfaces that would prevent adhesive bond of flooring adhesives.

3.03 INSTALLATION:

A. General:

1. Install flooring after finishing operations, including painting, have been completed and permanent heating system is operating. Moisture content of concrete slabs, building air temperature and relative humidity must be within limits recommended by flooring manufacturer.
2. Place flooring with adhesive cement in strict compliance with manufacturer's recommendations. Butt tightly to vertical surfaces, thresholds, nosings and edgings. Scribe around obstructions and to produce neat joints, laid tight, even, and straight. Extend flooring into toe spaces, door reveals, and into closets and similar openings.
3. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other non-permanent marking device.
4. Tightly cement flooring to subbase without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections.

B. Tile Flooring:

1. Lay tile from center marks established with principal column centerlines; square to room axis.
2. Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged if so numbered. Cut tile neatly around all fixtures. Broken, cracked, chipped, or deformed tiles are not acceptable. Lay tile with grain running in one direction.
3. Adhere tile flooring to substrates using full spread of adhesive applied in compliance with flooring manufacturer's directions.

C. Sheet Flooring:

1. Lay sheet flooring to provide as few seams as possible with economical use of materials. Match edges for color shading and pattern at seams in compliance with manufacturer's recommendations.
2. Adhere sheet flooring to substrates using method approved by flooring manufacturer for type of sheet flooring and substrate condition indicated.
   a. Use conventional full spread adhesive method unless otherwise recommended by manufacturer.
3. Prepare seams in sheet flooring in accordance with manufacturer's instructions for most inconspicuous appearance, sealing

continuously with fluid-applied sealant or adhesive standard with manufacturer.

D. Accessories:

1. Apply resilient base to walls, columns, pilasters, casework and other permanent fixtures in rooms or areas where base is required. Install base in as long lengths as practicable, with preformed corner units, or fabricated from base materials with mitered or coped inside corners. Tightly bond base to backing throughout the length of each piece, with continuous contact at horizontal and vertical surfaces.
2. Place resilient edge strips tightly butted to flooring and secure with adhesive. Install at edge of flooring which would otherwise be exposed.
3. Apply resilient accessories to stairs as indicated and in strict accordance with manufacturer's installation instructions.

3.04 CLEANING AND PROTECTION:

A. Remove any excess adhesive or other surface blemishes, using neutral type cleaners as recommended by flooring manufacturer. Protect installed flooring from damage by covering.

B. Finishing: After completion of project and just prior to final inspection of work, thoroughly clean floors and accessories in compliance with flooring manufacturer's instructions.

END OF SECTION

PART I - GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. The extent of carpeting is indicated on the drawings and in schedules and includes carpet, cushion and accessories.

B. The type of carpet installation specified is:

1. Stretch-in trackless.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. RESILIENT FLOORING: Vinyl base.

1.04 QUALITY ASSURANCE:

A. Installer: Firm with not less than 2 years of carpeting experience, similar to work of this Section.

B. Manufacturer: Firm with not less than 5 years of production experience with carpet similar to types specified in this section and whose published product literature clearly indicates compliance of product with requirements of this section.

C. General Standard: Comply with recommendations of Handbook of Carpets by Carpet Training Institute, which can be reasonable applied to types of carpeting required.

D. Maintenance Materials: Deliver usable scraps of carpet to Owner's designated storage space, properly packaged and identified. Usable scraps are defined to include roll ends of less than 9 ft. 0 in. length, and pieces of more than 3 sq . ft. area and more than 8 inches wide. Dispose of smaller pieces.

1.05 SUBMITTALS:

A. Product Data: Submit data to show compliance with requirements. Include test lavoratory reports and manufacturer's certifications and installation/maintenance instructions and recommendations for each type of carpet, cushion and accessory item required.

B. Samples: Submit 18 in. x 27 in. samples of each carpet required, and 6 in. lengths of exposed edge stripping.

C. Certification: Submit manufacturer's certification stating that carpet materials furnished comply with specified requirements.

1. Include supporting certified laboratory test data indicating that carpet meets specified test requirements.

1.06 DELIVERY AND STORY:

A. Deliver carpeting materials in protective wrapping, and store inside, protected from weather, moisture and soiling.

PART 2 - PRODUCTS

2.01 CARPET:

A. Tufted nylon, level loop carpeting with following characteristics:

1. Pile Fiber: 100% nylon, Multi-Lobe, Soil Hiding.
2. Pile Face Weight: 22 ounce/sq .yd.
3. Gage and Stitches: 1/8 in., 8.0/in.
4. Thickness, Pile Height: 0.203".
5. Dye Method: Yarn dyed.
6. Fade Resistance: 4 for 40 hours (AATCC 16E).
7. Static Resistance: 3.0 KV (AATCC 134).
8. Flammability: Pass pill test (ASTM D 2859); FRPT rating of 0.4 (NBS IR 75-950).
9. Primary Backing: Polypropolene.
10. Secondary Backing: Jute.
11. Tuft Bind: 11 lbs. (ASTM D 1335).

B. Conform with HUD Bulletin, UM 44-D as follows:

1. Use Type I, Class 2 for unit inteirors.
2. Use Type II, Class 2 for elderly or handicapped units and public spaces.
3. Provide densities for Type I and II as recommended.

C. Manufacturers offering products to comply with requirements are:

1. Lees Carpets.
2. Stratton Industries.
3. Wellco Carpet Co.

2.02 CARPET CUSHION:

A. General: Provide manufacturer's standard carpet cushion of type, weight and thickness indicated. Provide cushion which passes pill test for flammability, ASTM D 2859 (DOC FF-1-70).

B. Fiber/Hair Carpet Cushion: Animal hair top and jute fiber bottom with top and bottom rubber coated surfaces, treated for moth-vermine resistance; FS DDD-C-001023, Type II; 40 oz. per. sq . yd. and 3/8" thick.

2.03 CARPET ACCESSORIES:

A. Tackless Carpet Stripping: Water-resistant plywood strips, 3/8" thick to match cushion thickness, with angular pins protruding from top designed to grip and hold stretched carpet at the backing.

Provide narrow stripping with 2 rows of pins where stretched width of carpet is 20 ft. or less; wide stripping with 3 rows of pins where carpet width exceeds 20 ft.

B. Carpet Edge Guard, Metal: Extruded aluminum bend-down type edge guard, with concealed gripper teeth and punched anchorage flange; anodized aluminum finish of colors selected by Architect from among standard colors available.

C. Seaming Cement: Hot-melt seaming adhesive or similar product recommended by carpet manufacturer, for taping seams and buttering cut edges at backing to form secure seams and prevent pile loss at seams.

D. Miscellaneous Materials: As recommended by manufacturers of carpet, cushion and other carpeting products; and selected by Installer to meet project circumstance and requirements.

PART 3 - EXECUTION

3.01 PRE-INSTALLATION REQUIREMENTS:

A. Examine substrates for moisture content and other conditions under which carpeting is to be installed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Clear away debris and scrape up cementitious deposits from surfaces to receive carpeting; vacuum clean immediately before installation. Check concrete surfaces to ensure no "dusting": through installed carpet; apply sealer where required to prevent dusting.

C. Sequence carpeting with other work so as to minimize the possibility of damage and soiling of carpet during the remainder of the construction period.

3.02 INSTALLATION:

A. General:

1. Comply with manufacturer's instructions and recommendations for seam locations and direction of carpet; maintain uniformity of direction and lay of pile. At doors, center seams under doors; do not seam in traffic direction at doorways.

2. Extend carpet under open-bottomed obstructions and under removable flanges and furnishings, and into alcoves and closets of each space.

3. Provide cut-outs where required, and bind cut edges properly where not concealed by protective edge guards or overlapping flanges.

4. Install carpet edge guard where edge of carpet is exposed;

anchor guard to substrate.

B. Stretch-in Tackless Installation:

1. Install tackless carpet stripping with adhesives or by nailing, or both where required for adequate strength. Locate properly for concealment of carpet edge between stripping and base of wall. Strip entire perimeter of each carpeted space, and where possible at obstructions and cutouts.
2. Install cushion of type indicated in each space to be carpeted. Run seams at 90 degree angle with carpet seams. Place cushion with fabric covered or smoothest face up. Apply 2" fabric type adhesive tape on cushion seams. Staple to wood substrates as necessary to hold in place.
3. Install carpet by trimming edges, buttering cuts with seaming cement, taping or sewing seams to provide sufficient strength for stretching and continued stresses during life of carpet. Apply seaming cement over stitching on backing, if not covered by tape.
4. Stretch carpet both directions, the exact amount recommended by carpet manufacturer; trim edges, secure to stripping and conceal behind edge of stripping. Use power stretchers where sufficient space is available to operate properly.

C. Stairway Carpeting: Install by secure method recognized to be durable and safe for traffic. Conceal edges and avoid making seams in areas of high wear. Match adjoining carpet.

3.03 CLEANING AND PROTECTION:

A. Remove debris, sorting pieces to be saved from scraps to be disposed of.

B. Vacuum carpet using commercial machine with face-beater element. Remove spots and replace carpet where spots cannot be removed.

C. Provide protection methods and materials needed to ensure that carpeting will be without deterioration or damage at time of acceptance.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements apply, to the work of this Section.

1.02 DESCRIPTION OF WORK:

A. The extent of painting work is shown on the drawings and schedules and as herein specified.

B. The work includes painting and finishing of interior and exterior exposed items and surfaces throughout the project, except as otherwise indicated.

1. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of the work.

C. The work includes field painting of exposed bare and covered pipes and ducts (including color coding), and of hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under the mechanical and electrical work.

D. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

E. Paint all exposed surfaces whether or not colors are designated in "schedules", except where the natural finish of the material is specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas. If color or finish is not designated, the Architect will select these from standard colors available for the materials systems specified.

1.03 PAINTING NOT INCLUDED:

A. The following categories of work are not included as part of the field-applied finish work, or are included in other sections of these specifications.

B. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under the various sections for structural steel, miscellaneous metal, hollow metal work, and similar items. Also, for fabricated components such as architectural woodwork, wood casework, and shop-fabricated or factory-built mechanical and electrical equipment or accessories.

C. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer finishing is specified for such items as (but not limited to) metal toilet enclosures, prefinished partition systems, acoustic materials, architectural woodwork and casework, finished mechanical and electrical equipment including light fixtures, switchgear and distribution cabinets, elevator entrance frames, door and equipment.

D. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces, duct shafts and elevator shafts.

E. Finished Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting, unless otherwise indicated.

F. Operating Parts and Labels

1. Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting, unless otherwise indicated.
2. Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

1.04 SUBMITTALS:

A. Product Data: Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use.

B. Samples:

1. Submit samples for Architect's review of color and texture only. Compliance with all other requirements is the exclusive responsibility of the Contractor. Provide a listing of the material and application for each coat of each finish sample.
   a. On actual wall surfaces and other exterior and interior building components, duplicate painted finishes of the samples. On at least 100 sq. ft. of surface as directed, provide full-coat finish samples until required sheen, color and texture is obtained; simulate finished lighting conditions for review of in-place work.

1.05 DELIVERY AND STORAGE:

A. Deliver all materials to the job site in original, new and unopened packages and containers bearing manufacturer's name and label, and the following information:

1. Name or title of material.
2. Fed. Spec. number, if applicable.
3. Manufacturer's stock number and date of manufacture.
4. Manufacturer's name.

5. Contents by volume, for major pigment and vehicle.
6. Constituents.
7. Thinning instructions.
8. Application instructions.
9. Color name and number.

1.06 JOB CONDITIONS:

A. Apply water-base paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 50 degrees F and 90 degrees F unless otherwise permitted by the paint manufacturer's printed instructions.

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 45 degrees F and 95 degrees F unless otherwise permitted by the paint manufacturer's printed instructions.

C. Do not apply paint in snow, rain, fog or mist; or when the relative humidity exceeds 85%; or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instructions.

D. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application and drying periods.

PART 2 PRODUCTS

2.01 COLORS AND FINISHES:

A. Surface treatments, and finishes, are indicated in schedules.

   1. Provide manufacturer's full range of paint colors.

B. Prior to beginning work, the Architect will furnish color chips for surfaces to be painted.

   1. Use representative colors when preparing samples for review.
   2. Final acceptance of colors will be from samples applied on the job.

C. Color Pigments: Pure, non-fading, applicable types to suit the substrates and service indicated.

   1. Lead content in the pigment, if any, is limited to contain not more than 0.5% lead, as lead metal based on the total non-volitile (dry-film) of the paint by weight.
   2. This limitation is extended to all interior surfaces and those exterior surfaces, such as stairs, decks, porches, railings, windows, and doors which are readily accessible to children under seven years of age.

D. Paint Coordination: Provide finish coats which are compatible with prime paints used. Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates. Upon request from other trades, furnish information on characteristics of finish materials proposed for use, to ensure compatible prime coats are used. Provide barrier coats over incompatible primers or remove and reprime as required. Notify the Architect in writing of any anticipated problems using specified coating systems with substrates primed by others.

2.02 MATERIAL QUALITY:

A. Provide the best quality grade of the various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying the manufacturer's identification as a standard, best-grade product will not be acceptable.

1. Proprietary names used to designate colors or materials are not intended to imply that products of the named manufacturers are required to the exclusion of equivalent products of other manufacturers.
2. Federal Specifications establish the minimum acceptable quality for paint materials. Provide a written certification from the paint manufacturer that materials provided meet or exceed these minimums.
3. Manufacturer's products which comply with the coating qualitative requirements of applicable Federal Specifications, yet differ in quantitative requirements, may be considered for use only when acceptable to the Architect. Furnish material data and manufacturer's certificate of performance to the Architect for any proposed substitutions.

B. Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer, and use only within recommended limits.

2.03 EXTERIOR PAINT SCHEDULE: Provide the following paint systems for the various substrates, as indicated; manufacturer's full range of paint colors.

A. Painted Wood: Alkyd Gloss Finish: 2 finish coats over primer with total dry film thickness not less than 3.5 mils.

1. Prime Coat: Exterior Primer Coating (FS TT-P-25).
   a. Glidden: Y-1951 Spred Gel-Flo Base Coat.
   b. Moore: Moore's Moorwhite Primer.
   c. S-W: Exterior Wood Primer.
2. First and Second Finish Coats: Exterior Alkyd Oil Paint (FS TT-P-81).
   a. Glidden: Y-1901 Spred Gel-Flo.
   b. Moore: Moore's House Paint.
   c. S-W: SWP Exterior Gloss Paint.

B. Ferrous Metal: Full Gloss Alkyd Enamel: 2 Finish coats over primer.

  1. Prime Coat: Zinc Chromate Primer (FS TT-P-645). Primer is not required on items delivered shop primed.
     a. Glidden: Y-5533 Bar-Ox Zinc Chromate Primer.
     b. Moore: Ironclad Zinc Chromate Primer.
  2. First and Second Finish Coats: High Gloss Alkyd Enamel (FS TT-E-489).
     a. Glidden: Y-4500-Line Glid-Guard Industrial Enamel.
     b. Moore: Impervo High Gloss Enamel Exterior/Interior.
     c. S-W: S-W Metalistic II Enamel.

C. Zinc-Coated Metal: High Gloss Alkyd Enamel: 2 Finish coates over primer.

  1. Prime Coat: Zinc Dust-Zinc Oxide Primer (FS TT-P-641). Primer is not required on items delivered shop primed.
     a. Glidden: Y-5229 Glid-Guard Metal Primer.
     b. S-W: S-W Galvanized Iron Primer.
  2. First and Second Finish Coats: High Gloss Alkyd Enamel (FS TT-E-489).
     a. Glidden: Y-4500-Line Glid-Guard Alkyd Industrial Enamel.
     b. S-W: S-W Metalistic II Enamel.

2.04 INTERIOR PAINT SCHEDULE: Provide the following paint systems for the various substrates, as indicated; manufacturer's full range of paint colors.

A. Concrete Floors: Polymide Epoxy Coating: 2 coats.

  1. First and Second Coats: High gloss Polymide Epoxy (FS TT-C-535, Type II).

     a. Glidden: Y-5240 Line Chemical Resistant Epoxy.
     b. Moore: Ironclad Chemical and Water Resistant Epoxy Enamel.
     c. S-W: Tile-Clad II Epoxy Enamel B62 Series/B60V70.

B. Concrete Masonry Units: Semi-Gloss Alkyd Enamel Finish: 2 coats over filled surface with total dry film thickness not less than 3.5 mils, excluding filler coat.

  1. Filler Coat: Solvent-Thinned Block Filler (FS TT-F-1098). Apply filler coat at rate to ensure complete coverage with pores filled.
     a. Glidden: Y-5317 Line Ultra-Hide Acrylic Block Filler.
     b. Moore: Moore's Waterproofing Masonry Paint.
     c. S-W: S-W Pro-Mar Block Filler.
  2. First Coat: Enamel Undercoater (FS TT-E-543).
     a. Glidden: Y-5019 PVA Primer.
     b. Moore: Moore's Alkyd Enamel Underbody.
     c. S-W: Pro-Mar Alkyd Semi-Gloss Enamel.
  3. Second Coat: Odorless Interior Alkyd Semi-Gloss Enamel (FS TT-E-509).

- a. Glidden: Y-4600 Line Spred Lustre.
- b. Moore's Satin Impervo Enamel.
- c. S-W: S-W Pro-Mar Alkyd Semi-Gloss Enamel.

C. Gypsum Drywall and Plaster: Eggshell Latex Finish: 2 coats; unless otherwise indicated.

1. First Coat: Interior Latex Base Primer Coat (FS TT-P-650).
    - a. Glidden: Y-3416 Spred Primer Sealer.
    - b. Moore: Moore's Latex Quick-dry Prime Seal.
    - c. S-W: S-W Pro-Mar Latex Wall Primer.
2. Second Coat: Interior Latex Base Paint (FS TT-P-29).
    - a. Glidden: Y-3400 Line-Spred Latex Wall Paint.
    - b. Moore: Moore's Regel Wall Satin.
    - c. S-W: Pro-Mar 400 Latex Wall Paint.

D. Gypsum Drywall and Plaster: Semi-Gloss Enamel Finish: 3 coats with total dry film thickness not less than 2.5 mils: walls and ceilings of kitchens and baths. Omit primer coat on previously painted surfaces.

1. First Coat: Interior Latex Base Primer Coat (FS TT-P-650).
    - a. Glidden: Y-3416 Spred Primer Sealer.
    - b. Moore: Moore's Latex Quick-Dry Prime Seal.
    - c. S-W: Pro-Mar Latex Wall Primer.
2. Second and Third Coats: Odorless Interior Semi-Gloss Alkyd Enamel (FS TT-E-509).
    - a. Glidden: Y-4600 Line Spred Lustre Semi-Gloss.
    - b. Moore: Moore's Satin Impervo Enamel.
    - c. S-W: Pro-Mar Alkyd Semi-Gloss Enamel.

E. Ferrous Metal: Full Gloss Enamel Finish: 2 Coats over primer with total dry film thickness not less than 2.5 mils.

1. Prime Coat: Zinc Chromate Primer (FS TT-P-645). Primer is not required on items delivered shop primed.
    - a. Glidden: Y-5533 Bar-Ox Zinc Chromate Primer.
    - b. Moore: Ironclad Zinc Chromate Primer.
    - c. S-W: S-W Zinc Chromate Primer.
2. First Goat: Interior Enamel Undercoat (FS TT-E-543).
    - a. Glidden: Y-4500 Line Glid-Guard Alkyd Enamel.
    - b. Moore: Moore's Alkyd Enamel Underbody.
    - c. S-W: S-W Industrial Enamel.
3. Second Coat: Alkyd Gloss Enamel (FS TT-P-506).
    - a. Glidden: Y-4500 Line Glid-Guard Alkyd Enamel.
    - b. Moore: Moore's Impervo High Gloss Enamel.
    - c. S-W: S-W Industrial Enamel.

F. Zinc-Coated Metal: Full Gloss Enamel Finish: 2 Coats over primer with total dry film thickness not less than 2.5 mils.

1. Prime Coat: Zinc Dust - Zinc Oxide Primer Coating (FS TT-P-641). Primer is not required on items delivered shop primed.
    - a. Glidden: Y-5229 Glid-Guard All-Purpose Metal Primer.

  - b. Moore: Iron Glad Galvanized Metal Primer.
  - c. S-W: S-W Galvanized Iron Primer.
2. Second Coat: Interior Enamel Undercoat (FS TT-E-543).
   - a. Glidden: Y-4500 Line Glid-Guard Alkyd Enamel.
   - b. Moore: Moore's Alkyd Enamel Under body.
   - c. S-W: S-W Industrial Enamel.
3. Third Coat: Alkyd Gloss Enamel (FS TT-P-506).
   - a. Glidden: Y-4500 Line Glid-Guard Alkyd Enamel.
   - b. Moore: Impervo High Gloss Enamel.
   - c. S-W: S-W Industrial Enamel.

G. Painted Woodwork: Semi-Gloss Enamel Finish: 2 Coats.

1. First Coat: Interior Enamel Undercoat (FS TT-E-543).
   - a. Glidden: Y-555 Line-Spred Undercoater.
   - b. Moore: Moore's Alkyd Enamel Underbody.
   - c. S-W: S-W Wall and Wood Primer.
2. Second Coat: Odorless Interior Semi-Gloss Enamel (FS TT-E-509).
   - a. Glidden: Y-4600 Line-Spred.
   - b. Moore: Moore's Satin Impervo Enamel.
   - c. S-W: S-W Pro-Mar Alkyd Semi-Gloss Enamel.

H. Natural Finish Woodwork: Rubbed Varnish Finish: 2 finish coats over shellac plus filler on open grain wood.

1. First Coat: Bleached Shellac. (FS TT-S-300).
   - a. Moore: Moore's Benwood Quick-Dry Sanding Sealer.
   - b. S-W: S-W Pro-Mar Varnish Sanding Sealer.
2. Filler Coat on Open Grain Wood: Paste Wood Filler (FS TT-F-336). Wipe before first varnish coat.
3. Second and Third Coats: Oil Rubbing Varnish (FS TT-V-86).
   - a. Moore: Moore's Benwood Satin Finish Varnish.
   - b. S-W: S-W Oil Base Varnish, Gloss.

J. Wood Floors: Polyurethane Varnish Finish: 2 finish coats over filler.

1. First Coat: Paste Wood Filler (FS TT-F-36). Wipe before first varnish coat.
2. Second and Third Coats: Clear Polyurethane Varnish (FS TT-C-542, Type I, Class 1).
   - a. Moore: Moore's Polyurethane Floor Varnish.
   - b. S-W: S-W Polyurethane Varnish.

2.05 MANUFACTURERS: Provide painting products by one of the following:

A. Glidden Coatings and Resins (Glidden).
B. Sherwin Williams Company (S-W).
C. Benjamin Moore and Company (Moore).

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which painting work is to be applied. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

A. Starting of painting work will be construed as the Applicator's acceptance of the surfaces and conditions within any particular area.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to the formation of a durable paint film.

3.02 SURFACE PREPARATION:

A. General: Perform preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified, for each particular substrate condition.

1. Remove all hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for the complete painting of the items and adjacent surfaces. Following completion of painting of each space of area, reinstall the removed items by workmen skilled in the trades involved.
2. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program the cleaning and painting so that contaminants from the cleaning process will not fall onto wet, newly-painted surfaces.

B. Cementitious Materials: Prepare cementitious surfaces by removing efflorescence, chalk, dust, dirt, grease, oils and by roughening as required to remove glaze.

1. Determine alkalinity and moisture content by performing appropriate tests. If found to be sufficiently alkaline to cause blistering and burning of paint, correct this condition before application. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions.

C. Wood:

1. Clean wood surfaces to be painted of all dirt, oil, or other foreign substances with scrapers, mineral spirits and sandpaper as required. Sandpaper smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sandpaper smooth when dried.

2. Prime, stain, or seal wood required to be job-painted immediately upon delivery to job. Prime edges, ends, faces, undersides of such wood trim.
3. Seal tops and bottoms of unprimed wood doors.

D. Ferrous Metals: Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.

E. Galvanized Surfaces: Clean free of oil and surface contaminates with an acceptable non-petroleum based solvent.

3.03 MATERIALS PREPARATION:

A. Mix and prepare painting materials in accordance with manufacturer's directions.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing and application of paint in a clean condition, free of foreign materials and residue.

C. Stir materials before application to produce a mixture of uniform density, and stir as required during the application of the materials. Do not stir surface film into the material. Remove the film and if necessary, strain the material before using.

3.04 APPLICATION:

A. General:

1. Apply paint in accordance with the manufacturer's directions. Use applicator and techniques best suited for the substrate and type of material being applied.
2. Apply additional coats when undercoats, stains or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. Give special attention to insure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
3. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently-fixed equipment or furniture with prime coat only before final installation of equipment.
4. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
5. Paint the back sides of access panels, and removable or hinged covers to match the exposed surfaces.
6. Finish exterior doors on tops, bottoms and side edges the same as the exterior faces, unless otherwise indicated.
7. Sand lightly between each succeeding enamel or varnish coat.
8. Omit the first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.

B. Scheduling Painting:

1. Apply the first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as praticale after preparation and before subsequent surface deterioration.
2. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.
   a. Tint undercoats to distinguish each coat from finish color.

C. Minimum Coating Thickness: Apply each material at not less than the manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.

D. Mechanical and Electrical Work:

1. Painting of mechanical and electrical work is limited to those items exposed in mechanical equipment rooms and in occupied spaces.
2. Mechanical items to be painted include, but are not limited to, the following:
   a. Piping, pipe hangers, and supports.
   b. Tanks.
   c. Ductwork, installation.
   d. Motor, mechanical equipment, and supports.
   e. Accessory items.
3. Electrical items to be painted include, but are not limited to, the following:
   a. Conduit and fittings.
   b. Panelboards.

E. Prime Coats: Apply a prime coat of material which is required to be painted or finished, and which has not been prime coated by others.

1. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

F. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling such as laps, irregularity in texture, skid marks, or other surface imperfections.

G. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.

H. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

3.05 CLEAN-UP AND PROTECTION:

A. Clean-Up: During the progress of the work, remove from the site all discarded paint materials, rubbish, cans and rags at the end of each work day.

   1. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

B. Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to the Architect.

   1. Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.

C. At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, and General Conditions of the Contract and other Division 1 General Requirements, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of each specialty is shown on the drawings.

B. Provide each specialty with all accessories for a complete installation:

1. Extruded aluminum louvers
2. Mailboxes
3. Closet Shelving.
4. Fiberglass tub/shower enclosures.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. SEALANTS: Perimeter sealing.

1.04 QUALITY ASSURANCE: Manufacturer with not less than 5 years experience in the specialty specified, whose product literature clearly indicates compliance with requirements of this section.

1.05 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications, recommendations and standard details for each specialty including fabrication, finishing, hardware and other components of the work. Include certified test laboratory reports as necessary to show compliance with the requirements.

B. Shop Drawings: Submit shop drawings for the fabrication and installation of each specialty and associated components of the work. Show anchors, hardware, operators and other components not included in manufacturer's standard data.

C. Samples: Architect reserves the right to require samples which will show the fabrication techniques and workmanship or component parts, and the design of hardware and other exposed auxiliary items for each specialty before fabrication of the work.

PART 2 PRODUCTS

2.01 EXTRUDED ALUMINUM LOUVERS:

A. Furnish extruded aluminum louvers ASTM B221, Alloy 6063-T52 with extrusions not less than 0.08 inches thick, of type, depth and sizes indicated.

B. Fabricate frames to suit adjacent construction.

C. Assemble louvers and provide all supports, anchorages and accessories for complete installation.

D. Locate sills where shown, of same material and thickness as louvers.

E. Fasteners: Stainless steel or aluminum.

F. Provide 1/2 mesh .063 diameter wire intercrimp bird screen secured to removable inside frame.

G. Use non-ferrous or hot-dipped galvanized inserts.

H. Finish: Hardcoat anodized bronze integral color, AA-C22A42 7 mils thick.

J. Manufacturer:

1. Construction Specialties.
2. Airolite Company.
3. American Abrasive Metals Company.

2.02 MAIL BOXES: Vertical style units of size and style indicated.

A. Each gang of box units to open by mail carrier's key, tilting forward to receive incoming mail. Tenant's key only operates a single, side-hinged door.

B. Doors and Frames fabricated of manufacturer's standard heavy metal construction, ganged and nested units. Furnish card holder for tenant indentification, behind each box. Construct doors with concealed full-length flush hinge, and slots to receive tenants name and number.

1. Provide number indentification as selected by Architect from manufacturer's standards.
2. Fabricate units of aluminum extrusions, with satin anodized finish.
3. Locking: Furnish 5-pin tumbler cylinder lock capable of at least 1000 key changes, with 2 keys for each box door. Key each box differently and master key. Deliver box keys and master keys to Owner's representative, with record of each corresponding lock and key numbers.
4. Provide machined opening in frame to accomodate an inside lock furnished by local postmaster.

C. Boxes and Wall Receptacles: Manufacturer's standard galvanized steel or corrosion resistant metal construction.

D. Directory: Provide manufacturer's directory unit, of size and location indicated with integral doorbell buttons; units of same materials and finishes as box frames.

E. Manufacturer:

1. American Device Mfg. Co.
2. Bommer Industries, Inc.
3. Cutler-Federal, Inc.

2.03 CLOSET SHELVING: Vinyl coated, ventilated steel rod shelving and mounting hardware.

A. Provide integral hanging rod for clothes closets and matching intermediate support for shelves over 3'-6" wide.

B. Shelving capable of supporting 75 lbs. per sq. ft.

C. Maximum rod spacing of 1" o.c. and vinyl coating thickness of 12 to 14 mils.

D. Manufacturer: Closet Maid Corporation.

2.04 FIBERGLASS TUB/SHOWER ENCLOSURES: Fabricated of fiberglass reinforced rigidized acrylic; designed specifically for enclosure of tub/shower wall area.

1. Manufacturer: The Swan Corporation, St. Louis, MR.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which prefabricated specialties are to be installed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 INSTALLATION: Install specialty items in strict accordance with manufacturer's or fabricator's instructions and recommendations.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements, apply to the work of this Section.

1.02 DESCRIPTION OF WORK:

A. Extent of each type of toilet accessory is shown on the drawings and herein specified.

B. Type of toilet accessories required include the following:

1. Toilet tissue dispensers.
2. Grab bars.
3. Towel bars.
4. Shower curtain rods.
5. Mirrors.
6. Medicine cabinets.
7. Robe hooks.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. GYPSUM DRYWALL: Installation of substrate support.

1.04 QUALITY ASSURANCE:

A. Inserts and Anchorages: Furnish inserts and anchoring device which must be built in for the installation of toilet accessories. Provide setting drawings, templates, instructions and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delays.

1. Install grab bars to sustain a dead weight of 250 lbs. for five minutes at any point.

B. Products:

1. Provide products of the same manufacturer for each type of accessory unit and for units exposed in the same areas.
2. Coordinate with the Architect for acceptable designs and finishes.
3. Stamped names or labels on exposed faces of units will not be permitted, except where otherwise specified.

1.05 SUBMITTALS:

A. Product Data: Submit 2 copies of manufacturer's specifications and installation instructions for each toilet accessory.

B. Samples: When requested, submit full-size samples of units to Architect for review of color and finishes. Acceptable samples will be returned and may be used in the work.

PART 2 - PRODUCTS

2.01 MANUFACTURERS: Provide toilet and bath accessories as manufactured by one of the following:

A. American Specialties, Inc.
B. Franklin Brass Manufacturing Co.
C. McKinney/Parker, Essex Industries, Inc.

2.02 MATERIALS:

A. Stainless Steel: AISI, Type 302/304; No. 4 polished finish.

B. Brass: Cast or forged quality alloy, FS WW-P-541.

C. Zamak: ASTM B86, FS WW-P-541

D. Sheet Steel: Cold rolled, commercial quality, ASTM A 366. Surface preparation and metal pretreatment as required for applied finish.

E. Chromium Plating: Nickel and chromium electro-deposited on metal, ASTM B 456, Type SC 2.

F. Galvanized Steel Mounting Devices: Hot-dip galvanized after fabrication ASTM A 386.

G. Mirror: No. 1 Quality, 1/4" polished plate glass, electrolytically copper plated. Guaranteed against silver spoilage for 15 years.

2.03 TOILET TISSUE DISPENSER:

A. General: Provide toilet tissue dispensers where shown on the drawings and typically one at each water closet.

B. Toilet Tissue Dispenser: Fabricate units of not less than 0.013 chrome plated steel, to dispense one 4-1/2 in. x 4-1/2 in. core tissue roll.

1. Fabricate surface-mounted units for concealed installation.

2.04 GRAB BARS:

A. General: Provide grab bars where shown on the drawings.

B. Stainless Steel Grab Bars:

1. Heavy-Duty Size: 1-1/4" inch o.d. unless otherwise indicated, with wall thickness not less than 0.050 inches (18 gage); 1-1/2 inches between edge of bar and wall.
2. Non-slip Gripping Surfaces: Peened, knurled or striated, manufacturer's standard unless otherwise indicated.
3. Mounting: Exposed, with manufacturer's standard flanges and anchorages for type of subtrate shown.

2.05 TOWEL BARS: Polished chrome plated type where shown on drawings; typically 2 per bath; 1 for half bath.

2.06 SHOWER CURTAIN RODS: Satin finished stainless steel type; typically one at each tub-shower.

2.07 ROBE HOOKS: Chrome plated zinc alloy double prong hook; typically one on back of each bathroom door.

2.08 MIRRORS:

A. Provide mirrors above lavatories where indicated.

B. Stainless Steel Framed Standard Type: Fabricate frame with channel shapes of not less than 20 gage with square corners carefully mitered to hairline joints and mechanically interlocked; size as indicated.

2.08 MEDICINE CABINETS:

A. Provide medicine cabinets above lavatories where indicated.

B. Surface medicine cabinet formed of 20 gage steel with white enamel finish and hinged mirrored glass door with stainless steel trim, 3 glass shelves; size as indicated.

PART 3 - EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which toilet accessories are to be installed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 INSTALLATION:

A. Use concealed fastenings where possible.

B. Provide anchors, bolts and other necessary fasteners, and attach accessories securely to walls and partitions in locations as shown or directed.

C. Install concealed mounting devices and fasteners fabricated of the same materials as the accessories or of galvanized steel.

D. Install exposed mounting devices and fasteners finished to match the accessories.

E. Secure accessories to adjacent walls and partitions complying with the manufacturer's instructions for each item and each type of substrate construction.

1. Comply with handicapped code requirements.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, and General Conditions of the Contract and other Division 1 General Requirements, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of waste handling equipment is indicated on drawings and by provisions of this section.

B. Types of equipment required for project include:

1. Packaged waste compactor unit.
2. Prefabricated trash chute.

C. Data/performance schedules at end of this section indicate specific requirements for each unit of waste handling equipment.

1.03 REALATED WORK SPECIFIED ELSEWHERE:

A. FIRE PROTECTIONS: Service to sprinkler heads.
B. PLUMBING: Water and drain service.
C. ELECTRICAL: Electrical Service.

1.04 QUALITY ASSURANCE:

A. Waste Compactor Standards: Comply with Federal, State and Local regulations; and comply with other standards as indicated.

1. ANSI Standards: Comply with the following standards as applicable to requried units.
   a. ANSI Z245.1, "Safety Requirements for Refuse Collection and Compaction Equipment".
   b. ANSI/NFPA 82, "Incinerators, Waste and Linen Handling Systems and Equipment".

B. Trash Chute Standards: Comply with Federal, State and Local regulations; and other standards as indicated.

1. ANSI Standards: Comply with the following standards as applicable to required units:
   a. ANSI/NFPA 82, "Incinerators, Waste and Linen Handling Systems and Equipment".
   b. ANSI Z245.1, "Safety Requirements for Refuse Collection and Compaction Equipment.
2. UL Labels: Provide trash chute door/frame assemblies bearing UL "B" label for 1.5-hr. protection with 30-min. temperature rise of 250 degrees F (139 degrees C).

C. Electrical Component Standards: Provide components complying with NFPA 70 "National Electrical Code"; and bearing UL labels where available.

1.05 SUBMITTALS:

A. Product Data: Product specifications, performance data sheets, and installation instructions including certified test reports on operation of units.

B. Shop Drawings: Plans, elevations and details for work not fully shown by published product data; include rough-in dimensions and service connection details.

C. Maintenance Manuals: Bound manufals for each major operational unit of equipment. Including and maintenance instructions, parts listing, parts inventory listing, purchase source listing for operational/maintenance materials, emergency instructions and similar information.

PART 2 PRODUCTS

2.01 MANUFACTURERS: Subject to compliance with requirements, provide products of one of the following manufacturers in each category:`

A. Waste Compactor Manufacturers:

1. Auto-Pak Div.; General Defense; Red Lion, PA
2. Compackager, Inc.; McLean, VA
3. Hico Corp. of America; Bronx, NY
4. International Dynetics Corp.; South Norwalk, CT

B. Trash Chute Manufacturers:

1. Cutler-Federal, Inc.; Eaton Park, FL
2. U.S. Chutes Corp.; Brookfield, CT
3. Van-Packer Co.; Beach Haven, NJ
4. Wilkinson Chutes, Inc.; Stow, OH

2.02 MATERIALS AND COMPONENTS:

A. Provide manufacturer's standard packaged, pre-engineered or prefabricated units except as otherwise indicated, with selections as indicated to comply with requirements; and with components of each unit complying with manufacturer's published literature, and as required for a complete system.

B. Materials, General:

1. Stainless Steel: AISI Type 302/304, with manufacturer's standard directional polish or stain finish on exposed surfaces.
2. Zinc-Coated Steel Sheet: ASTM A 526 except where another type is required for forming, heat resistance or other exposures; ASTM A 525 G90 zinc coating, with chemical treatment except mill phosphatized where indicated for painting or coating.
3. Metal Coating: Manufacturer's standard baked synthetic enamel primer and finish coats, slected for resistance to damage or deterioration from exposure conditions.

4. Electrical Work: Provide materials, devices and controls of type and quality recommended by NEMA for applications indicated. Refer to Division 16 sections hereof for power characteristics and service to equipment units, including disconnect switches (not work of this section).

C. Fabrication:

1. General: Fabricate metalwork with manufacturer's standard joints and seams, with exposed edges smoothed and eased. Fabricate bins, hoppers, chutes, compaction chambers, unit bodies and similar components of steel plate with welded joints. Reinforce with structural steel members sized and spaced to withstand impacts and pressures of normal operations, and sufficient to prevent excessive long-term development of waves or valleys. Fabricate with replaceable parts at points of normal wear.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which waste handling equipment work is to be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 INSTALLATION:

A. Set each component of work securely and accurately in place; plumb, level and properly aligned with other components and other work. Anchor as required for secure operation.

B. Complete field assembly with joints as recommended by manufacturer. Grind welds smooth and restore finish. Comply with NECA Standards for electrical work.

3.03 TESTING AND INSTRUCTIONS: Test each item of operational equipment including safety devices and fire protection equipment. Instruct Owner's operational personnel in proper use and maintenance of equipment, and demostrate capacity ratings, safety features, cleaning procedures, and proper storate/handling of raw and processed waste materials.

3.04 WASTE COMPACTOR SCHEDULE:

A. Type: Automatic, multiple bag type, horizontal, hydraulic, hopper-fed, compactor unit.

B. Maximum Height: 5'-8" to top of hopper.

C. Hydraulic Unit: Single stage pump delivering 6 gpm up to 2000 psi, 15 gallons hydraulic oil reservoir, and 5" x 26" stroke heavy duty hydraulic cyliner with 3" piston rod; producing up to 39, 270 lbs. force for a ram face pressure of 148 psi with cycle time of 37 seconds.

D. Power Supply: 208/220/440 volts, 3 phase.

E. Capacity: Approximately .132 cubic yards with hourly displacement of approximately 14.8 cubic yard.

F. Contruction: Steel ram floor 3/8" thick, 1/4" thick shell, 5/8" thick ram face, 3/8" thick snout, serrated wear-resistant shear teeth 1-1/4" thick and 14 gage receiving hopper; total weight 1650 lbs.

G. Control System: Photocell actuator with false-start protection; automatic shut-down features for jamming, access door interlock, low oil level, motor overload, and other standard safeties offered by manufacturer.

H. Sanitation: Equip unit with automatic insecticide and deodorizer dispenser system.

J. Model: Gobbler II as manufactured by Auto-Pak or equal model by compackager, Hico or International Dynetics Corp.

3.05 WASTE CHUTE SCHEDULE:

A. Diameter: 24 inches, 18 gage stainless steel.

B. Intakes: 15 x 18 inches, stainless steel, bottom-hinged, self closing, hand-operated, hopper-type doors held closed by latches and bearing 1-1/2 hour 250 degree UL "B" label.

C. Oulet Section: 16 gage stainless steel, braced to slab above.

D. Discharge: Fireproof Type A, normally open, inclined rolling door activated by fusible link hold-open and smoke detector.

E. Vent: Full diameter chute extending through roof to height 4 feet above roof and capped with 24 inch diameter, 22 gage galavanized steel, glazed explosion vent.

F. Sanitizing Unit: Flushing and disinfecting type with on-off vent and valve to regulate proportion of disinfectant to hot water.

G. Heat Control Devices: At alternate floors, fusible valve to actuate sprinkler head. Sprinkler heads protected by 20 gage sheild.

END OF SECTION

PART I GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1 General Requirements applay to work of this section.

1.02 DESCRIPTION OF WORK:

A. Provide appliances complete and in conformance with drawings and specifications.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. PLUMBING: Plumbing service.
B. ELECTRICAL: Electrical service.

1.04 QUALITY ASSURANCE:

A. Installation is to be performed by the manufacturer or his licensed representative.

B. Manufacturer:

1. General.
2. Frigidaire.
3. Sears Roebuck and Co.

1.05 SUBMITTALS:

A. Manufacturer's literature and location sketch showing work required by other trades.

B. User's operation and maintenance manuals.

1.06 WARRANTY:

A. Delivery appliance warranties to Owner prior to final acceptance of work.

PART 2 PRODUCTS:

2.01 APPLIANCES: Provide appliance colors as selected by architect from manufacturer's standards.

A. Range: General Electric Model JBS16GJ (Electric Range) of Frigidaire/Sears equal. In efficiency units only General Electric Model JMC27GJ or Frigedaire/Sears equal.

B. Range Hood: General Electric Model JV334J or Frigidaire/Sears equal.

C. Refrigerator: General Electric Model TBX21DK or Frigidaire/Sears equal. In efficiency units only General Electric Model TA7SJ or Frigedaire/Sears equal.

D. Disposal: General Electric Model GFC440G or Frigidaire/Sears equal.

E. Cooktop (in handicapped units only): General Electric Model JP661C or Frigidaire/Sears equal.

F. Wall Oven (in handicapped units only): General Electric Model JKP16GJ or Frigidaire/Sears equal.

G. Automatic Washer (in handicapped and 4 BR units only): General Electric Model WWA8310G or Frigidaire/Sears equal.

H. Electric Dryer (in handicapped and 4 BR units only): General Electric Model DDE7500G or Frigidaire/Sears equal.

PART 3 EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which appliances will be installed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 PREPARATION:

A. Furnish necessary information for location of mechanical and electrical service to the related work of other sections.

B. Furnish necessary appliance dimensions and tolerances to coordinate with the cabinet casework.

3.03 INSTALLATION: Set all appliances into their final location and prepare for mechanical and electrical hook-up. Set all appliances plumb, level and true. Lubricate and adjust, leaving equipment fully operable and ready for service hook-ups.

END OF SECTION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1, General Requirements, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of kitchen and bath cabinets is indicated on drawings.

B. Types, Sizes and Shapes: As shown, complete with drawers, doors, shelves, compartments for appliances and fixtures and special fixtures as indicated.

1. Provide adjustable units for handicapped use where indicated.

1.03 RELATED WORK SPECIFIED ELSEWHERE:

A. KITCHEN APPLIANCES

B. PLUMBING: Sink, lavatories and disposals.

1.04 QUALITY ASSURANCES:

A. Kitchen Cabinet Standard: ANSI A161.1

1. NKCA Certification: Provide kitchen cabinets with National Kitchen Cabinet Association (NKCA) "Certified Cabinet" seal affixed in a semi-concealed location of each unit, evidencing compliance with above standard.

B. conform with Massachusetts Housing Finance Agency recommendations for design, materials and quality of construction. Review and acceptance by the Agency is required before installation.

C. Countertop Standard: ANSI A161.2.

D. Field Measurements: Verify sizes and shapes of countertops prior to fabrication by field measurements taken after base cabinets are installed.

1.05 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data and installation instructions indicating materials, hardware, and finishes used in fabrication of kitchen cabinets, as required to show compliance with specifications.

B. Shop Drawings: Submit shop drawings indicating location and size of each type of cabinet and countertops, accessories, materials, finishes, hardware types and locations, fillers, etc. Include fully dimensioned plans and elevations and indicate details of anchorage to countertop and to walls.

C. Samples: Submit fully finished samples of following items required for kitchen cabinets:

1. Plastic laminate, 3 samples, 12" square, for each type of finish.
2. Exposed hardware, one unit of each type and finish.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Protect cabinets and countertops during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver cabinets and countertops until painting, wet work, grinding and similar operations, which could be performed before installation of kitchen cabinets, have been completed in installation areas. Store kitchen cabinets and countertops in installation areas or, if that is impracticable, in areas with similar ambient conditions.

1.07 JOB CONDITIONS:

A. Conditioning: Comply with cabinet manufacturer's recommendations for temperature and humidity requirements in cabinet installation areas. Do not install cabinets and countertops until required temperature and relative humidity have been stabilized and will be maintained in installation areas.

B. Maintain temperature and humidity in installation areas as required to maintain moisture content of installed cabinet work within a tolerance range of the optimum moisture content acceptable to cabinet manufacturer, from date of installation through remainder of construction period.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS:

A. Available Manufacturers: Subject to specified requirements, manufacturer's offering products which comply include the following:

1. Aristokraft.
2. Imperia Cabinet Corp.

2.02 DEFINITIONS:

A. Exposed portions of cabinets include all surface including edges visible when doors and drawers are closed. Also included are visible surfaces and visible edges of shelves in open cabinets or behind glass doors and underside of bottoms of cabinets over 4'-0" above floor.

B. Semi-exposed portions of cabinets include surfaces behind opaque doors and drawer fronts including shelves, dividers, interior faces of cabinet ends, backs, tops and bottoms, drawer sides, backs and bottoms, and back face of doors. Also included are underside of bottoms of cabinets. Between 2'-0" and 4'-0 from floor and flat tops 5'-9" or more above floor.

C. Concealed portions of cabinets include sleepers, web frames, dust panels and other surfaces not normally visible after installation, including underside of bottoms of cabinets less than 2'-0" above floor.

2.03 BASIC MATERIALS:

A. Particleboard: ANSI A208.1 mat-formed particleboard, Grade 1-M-2 with minimum density of 40 lbs. per cu. ft., internal bond of 60 psi; and minimum screwholding capacity of 225 lbs. on faces and 200 lbs. on edges.

B. Plastic laminate: NEMA LD-3, of thickness, type and grade designation indicated; in colors or patterns and finishes as selected by Architect from manufacturer's standard selections.

C. Hardware Lumber: Clear, dry, sound, and free of defects selected from First Grade lumber (NHLA), of species indicated.

2.04 PLASTIC LAMINATE CABINETS:

A. Exposed Surfacing Material of Doors, Drawer Fronts, Fixed Panels, Toeboards and Ends: High pressure plastic laminate, 0.028" thick, General purpose Type (GP-28).

B. Semi-Exposed Surfacing Material and Doors: High pressure plastic laminate, 0.020" thick, Cabinet Liner Type (CL-20), in color or pattern and finish matching exposed surfacing of cabinets.

C. Remaining Semi-Exposed Materials: Decorative boards, General Purpose Type, conforming to NEMA LQ-1 with decorative faces in patterns or colors and finish as selected by Architect from manufacturer's standard choices.

D. Concealed Materials: Any sound, dry solid lumber, plywood or particleboard or combination thereof; without defects affecting strength, utility or stability. On concealed surfaces of portions constructed of decorative boards, provide decorative or cabinet liner laminate backing (Light-Duty Type).

E. Core Material of Plastic Laminates: Particleboard.

F. Treatment of Exposed and Semi-Exposed Edges: Unless they are wood, edge doors and drawer fronts with plastic laminate of same material as exposed faces. Edge top of drawer body with high impact plastic tee edging. Edge remaining portions of cabinets with high pressure plastic laminate not less than 0.028" thick matching adjoining plastic laminate in colors or patterns and finish.

G. Style of Face Construction: Flush overlay style with drawer fronts, doors and fixed panels overlaying and concealing face frames of cabinet body.

H. Cabinet Construction:

1. Sides, Dividers, Tops, Bottoms, Shelves and Stretchers: Not less than 1/2" thick. Provide stretchers at top of base cabinet.
2. Backs: Not less than 1/8" thick.
3. Drawers: Sides, subfronts and backs: not less than 1/2" thick; bottoms: not less than 1/4" thick. Provide box type construction with front, bottom and back rabbeted in sides and secured with glue and mechanical fasteners.
4. Joinery: Rabbet backs flush into end panels and secure with concealed mechanical fasteners. Connect wall cabinet tops and bottoms and base cabinet bottoms and stretchers to ends and dividers by means of mechanical fasteners. Rabbet tops, bottoms and backs into end panels.
5. Subbase: Not less than 3/4" thick, of height and relationship to cabinet fronts and exposed ends as indicated.

2.05 COUNTERTOPS:

A. Exposed Surfacing Material: High pressure plastic laminate, 0.050" thick, General Purpose Type (GP50).

B. Substrate (Core) for Exposed Surfacing Material: Particleboard.

C. Countertop Configuration: (ANSI A161.2) Provide countertops with the following front styles (nose), cove and backsplash style.

1. Front Style: Self-edge.
2. Cove: Direct bond.
3. Backsplash Style: D (Square edge with scribe).

D. Countertop Thickness: Not less than 1-1/2", with substrate (core) not less than 3/4" thick.

2.06 CABINET HARDWARE: Provide manufacturer's standard hardware units complying with ANSI A156.9, of type, material, size and finish selected by Architect from manufacturer's standard choices.

A. Provide 3" wire pulls on drawers and doors; satin chrome finish.

B. Provide concealed self-closing hinges on doors.

C. Provide full length side mounted ball-bearing slides with positive stop on drawers.

D. Provide heavy showcase type standards and brackets for adjustable counters for handicapped kitchens.

1. Products: Knape & Vogt No. 87 slotted standards and No. 187 brackets or approved equal.

2.07 ACCESSORIES: Provide manufacturer's standard accessories of type indicated.

A. Sliding Cutting Board: Removable unit for installation above 4-1/2" high drawer in base unit.

B. Cutlery Dividers: Lengthwise dividers for 6" and 4-1/2" deep drawers, of adjustable spacing.

2.08 FABRICATION:

A. Fabricate kitchen cabinets to dimensions and profiles and details indicated.

B. Assemble units in shop in as large components as practicable to minimize field cutting and jointing.

PART 3 - EXECUTION

3.01 INSPECTION: Examine the areas and conditions under which the work is be performed. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 INSTALLATION:

A. Install cabinets plumb, level, true and straight with no distortions. Shim as required using concealed shims. Where kitchen cabinets abut other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips and mouldings as indicated or required, and in finish to match cabinet face.

B. Anchor cabinets securely in place with concealed (when doors and drawers are closed) fasteners, anchored into structural support members of wall construction. Comply with manufacturer's instructions for support of units.

C. Attach Countertops securely to base units. Spline and glue joints in countertops; provide concealed mechanical clamping of joint. Provide cutouts for fixtures and appliances as indicated; drill pilot holes at corners before making cutouts. Smooth cut edges and coat with waterproof coating or adhesive.

D. Complete hardware installation and adjust doors and drawers for proper operation.

3.03 CLEANING AND PROTECTION: Repair or remove and replace defective work as directed upon completion of installation.

A. Clean exposed: and semi-exposed surfaces, touch-up finish as required. Remove and refinish damaged or soiled areas.

B. Protection: Provide protection and maintain conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.

END OF SECTION

PART 1 GENERAL

1.01 RELATED DOCUMENTS: Drawings, General and Supplementary Conditions of the Contract and Division 1, General Requirements, apply to work of this section.

1.02 DESCRIPTION OF WORK:

A. Extent of hydraulic elevator work is indicated on the drawings and by provisions of this section.

B. Type of elevator work included is for:

1. Passenger elevator.

C. Definitions: Hydraulic elevator work is hereby defined to include systems in which cars are hoisted either directly or indirectly by action of a hydraulic plunger and cylinder (jack); with other components of the work including fluid storage tank, pump, piping, valves, car enclosures, hoistway entrances, control systems, signal equipment, guide rails, electrical wiring, roping, buffers, and devices for operating, dispatching, safety, security, leveling, alarm, maintenance and similar performances and capabilities.

D. Elevator schedule indicates required performances, controls, capacities, features and finishes for each elevator.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. CAST-IN-PLACE CONCRETE: Elevator pits.

B. DAMPPROOFING: Hoistway roofing.

C. FLEXIBLE SHEET ROOFING: Hoistway roofing.

D. GYPSUM DRYWALL: Hoistway.

E. PREFABRICATED SPECIALTIES: Louver ventilators.

F. MECHANICAL DIV.: Plumbing and ventilating of hoistways.

G. ELECTRICAL: Electrical service.

1.04 QUALITY ASSURANCE:

A. Installer Qualifications: Either elevator manufacturer or licensee of manufacturer, who has not less than 5 years' successful experience with installation of similar elevators.

B. Regulatory Requirements:

1. Elevator Code: Except for more stringent requirements indicated or imposed by governing regulations (which must be complied with), comply with applicable requirements of "American Standard

Safety Code for Elevators, Dumbwaiters, Escalators and Moving Walks" (ANSI A17.1) published by The American Society of Mechanical Engineers, herinafter referred to as the "Code".

2. NFPA Code: Comply with applicable NFPA No. 80, and provide units bearing UL labels with 30-min. temperature rise on labels.
3. Fire Resistance of Entrances: Comply with NFPA No. 80, and provide units bearing UL labels with 30-min. temperature rise on labels.
4. Standards for Handicapped: Comply with NEII "Suggested Minimum Passenger Elevator Requirements for the Handicapped" and state code, including clearances, handrails, locations for signal equipment and similar provisions.

1.05 SUBMITTALS:

A. Product Data: Technical product data and installation instructions for each principal component or product, and include certified test reports on required testing. List and describe features of control system, performances, and operating characteristics.

B. Shop Drawings: Plans, elevations and details of car enclosures and hoistway entrance. Prepare elevatoring diagrams to show service to each level. Show excavation requirements for jack.

C. Samples: Samples of exposed finishes of car enclosures, hoistway entrances, and signal equipment; 8" squares of materials and 12" lengths of running trim members.

D. Maintenance Manuals: Bound manual for each elevator or group of elevators, with operating and maintenance instructions, parts listing, recommended parts inventory listing, purchase source listing, for major and critical components, emergency instructions, and similar information.

E. Certificates and Permits: Provide Owner with copies of inspection/acceptance certificates and operating permits as required by governing authorities to allow normal, unrestricted use of elevators.

1.06 INITIAL MAINTENANCE AND WARRANTY:

A. Maintenance: For 3 months following date of substantial completion, provide full maintenance of elevator work on a daily-surveillance basis. Correct operational faults and restore/replace defective/deteriorated components and finishes. Lubricate units and supply materials required for proper operation and maintenance.

B. Warranty: Provide warranty, signed by Contractor, Installer and Manufacturer, agreeing to replace/repair/restore defective materials and workmanship of elevator work during warranty period. "Defective" is hereby defined to include, but not by way of limitation, operation or control system failures, performances below required minimums, excessive wear, unusual deterioration or aging of materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration, and similar unusual, unexpected and unsatisfactory conditions.

1. Warranty period is 18 months starting on date of substantial completion of elevator work.

PRODUCTS

2.01 MANUFACTURERS: Subject to compliance with requirements, provide products of one of the following:

A. Dover Corp.

B. Montgomery Elevator Co.

C. Schindler Elevator Co.

2.02 MATERIALS AND COMPONENTS:

A. General Requirements: Provide manufacturer's standard pre-engineered elevator systems which comply with requirements of elevator schedule at end of this section; or provide custom manufactured elevator systems which will fulfill requirements. Where not indicated, provide components, included in standard pre-engineered elevator systems, and required for a complete system.

B. Hydraulic Machines and Elevator Equipment:

1. General: Provide manufacturer's standard single-acting under-the-car hydraulic plunger-cylinder unit for each elevator, with electric pump-tank-control system equipment in machine room as indicated.
2. Hydraulic Plunger: Cylinder Assembly: Provide manufacturer's standard direct-lift single-cylinder, single-acting plunger and cylinder assembly, designed for the pressure resulting from load and speed requirements of the elevator. Fabricate plunger of seamless steel tubing. Protect cylinder below pit floor with triple wrapping of 4-mil carbonated polyethylene film, each applied with rubberized asphalt compound 56 mils thick. Provide manufacturer's standard babbit-lined or bronzed plunger guide bearings and oil-seal with assembly with drip ring and wiper. Weld cylinder support brackets to cylinder walls.
3. Casing (Well): Furnish heavy-walled, smooth steel cylinder casing for excavation to receive plunger-cylinder assembly. Design casing with adequate tolerance to permit accurate centering and plumbing plus 1 inch additional diameter of every 15ft. (or fraction thereof) of cylinder depth in excess of 20 ft. Extend casing 3 ft. 0 in. below bottom of cylinder. Clean casing inside out of loose rust and scale, and paint wit rust-inhibitive coating of 2 mils dry film thickness. Provide exterior seal flange near top, for encasement in concrete floor of pit. Provide exterior seal flange near top, for encasement in concrete floor of pit. Fabricate casing for the earliest possible delivery to the project site.

a. Provide cylinder-centering unit, of 3 adjustable steel centering lugs on a clamping ring around cylinder, located 5 ft. 0 in. above the bottom, with additional units spaced at 20 ft. intervals above, but not higher than 15 ft. from the top.

4. Hydraulic Power Unit: Provide manufacturer's self-contained, compact type hydraulic elevator power unit, including electric motor, adjustable belt drive, non-pulsating constant-displacement type pump, piping, control valve assembly, self-cleaning strainers, oil gauge, overhead oil storage tank on steel support frame, oil drip pan and bed plate. Provide auxiliary devices and fitting required for performance as specified, including manual valve for return of car to lowest landing. Provide sound absorbing, ventilated, removable steel enclosure panels for passenger elevators.

   a. Motor: Provide high-starting-torque, single-spaced, A.C. motor, sized for continuous elevator operation at full rated capacity and speed, under a program of normal maintenance and parts replacement, without overheating or other failure during the life of the building.

   b. Control Valves: Solenoid-operated, designed for slow opening and closing, as required for controlled acceleration and deceleration and for smooth stopping and starting of car, both for "up" and "Down" travel (automatic 2-way leveling).

      1. Limit acceleration and deceleration rates to the range of 3 to 5 ft. per sec., regardless of rated elevator speed.

   c. Mounting: Mount hydraulic power unit bedplate and steel frame assemble onto floor or foundation with efficient, failsafe isolation mounts, designed to effectively eliminate the transfer of vibrations of the building structure.

   d. Oil: Provide full supply of hydraulic oil, of the type and grade recommended by the manufacturer.

5. Electrical Controller Unit: Provide elevator-magnetic type control equipment, with switches and other devices mounted on panels or non-frames for either floor (free-standing) or wall mounting. Provide equipment designed to control starting and stopping, and to protect the motor from damage due to overload or excess current, and to cut off power and bring the car to rest in the event of safety device operation or other possible events which might result in malfunction of elevators.

   a. Equip controller unit with electrical and electrical and electronic devices needed to perform the specified operations of the elevator or group of elevators. Use flame-resistant wiring, neatly formed and tied to panels.

   b. Provide "Low Oil Feature" which automatically returns car to lowest level, opens doors and prevents operation of elevator until oil supply has been replenished.

c. Mount "power panel" equipment either with other control equipment or on the hydraulic power unit, at manufacturer's option.

6. Piping: Provide size, type and weight piping recommended by manufacturer, and provide isolation couplings to prevent sound/vibration transmissions for power unit.
7. Inserts: Furnish required concrete inserts and similar anchorage devices for the installation couplings to prevent sound/vibration transmissions for power unit.
8. Car Frame and Platform: Manufacturer's standard welded steel units; except provide special heavy-duty units where indicated for power truck loading (freight elevators), designed to withstand impacts and wheel loadings indicated.

C. Control Systems:

1. General: Provide manufacturer's standard control system for each elevator as required to provide automatic or group automatic operation of the type indicated, and defined in the Code as "Operations".
2. Single Elevator Control: Provide solid-state selective collective operation.

D. Auxiliary Operations/Controls:

1. General: In addition to primary control system features, provide the following controls or operational features for passenger elevators:

   a. Top-of-car inspection operation.
   b. Automatic 2-way leveling.

E. Signal Equipment: Provide manufacturer's standard signal equipment for each elevator or group of elevators. Provide car control station and car position indicator in each car, hall push-button station on each landing for each elevator or group of elevators but not less than one station for each 4 elevators in a group, and other units as indicated. Provide illuminated buttons and signals, which light-up when activated and remain lighted until call or other function has been fulfilled; fabricate of acrylic or other permanent translucent plastic. Except for buttons and illuminated signal elements, fabricate signal equipment with exposed surfaces of stainless steel with manufacturer's standard directional polish or satin finish.

F. Car Control Stations: Provide flush-mounted metal panels, containing call button for each landing served, and containing other other buttons, switches and controls required for specified car operation and control. Mount as shown, or scheduled, and at height complying with NEII "Suggested Minimum Required for the Handicapped". If not otherwise indicated, mount in return panel adjacent to car door. Provide operating device symbols with manufacturer's standard identification for required use or function.

G. Car Position Indicator: For passenger elevator cars, provide either illuminated-signal type or digital-display type, located near top of car. Include direction-of-next travel signal if not provided in car control station.

H. Hall Push-Button Station: Locate at location most convenient for approaching passengers. Provide type with flat face plate for surface mounting on wall finish (body of unit recessed). Provide 2-button station where passengers can travel either direction; 1-button station where only one direction of travel is available, and indicate which direction that is.

J. Hall Lanterns: Provide units with illuminated "up" and "down" signal arrows, but provide single arrow where only one direction is possible. Provide units projecting from face plate for ease of angular viewing, except provide flush units where a location in hoistway entrance frame is indicated. Match materials, finishes and mounting method with hall push-button stations.

1. At manufacturer's option, hall lantern signals may be placed either above hoistway entrance or in both jambs of entrance frame for each elevator.
2. Equip each hall lantern signal to sound a single-tone gong with adjustable volume, in response to hall calls (but not in response for car calls) when car is approaching in the called direction and is set to stop.

K. Hall Position Indicator: Provide illuminated-signal type or digital-display type signal, located above each hoistway entrance at ground floor. Match materials, finishes and mounting method with hall push-button stations.

1. At manufacturer's option, hall lantern signals may be integrated with hall position indicators.

L. Telephone: Provide rough-in for telephone hand set in each car, contained in flush-mounted cabinet and complete with identification and instructions for use.

K. Alarm System: Provide emergency alarm bell properly located within building and audible outside hoistways, equipped to sound automatically in response to emergency stops and in response to "Alarm" button at each car control station.

1. Provide additional weatherproof emergency signaling device of minimum 80 decibel rating, complying with code and mounted on building exterior in location as shown or directed.

N. Passenger Elevator Car Enclosures:

1. General: Except as otherwise indicated, provide manufacturer's standard pre-engineered car enclosures, of the selections indicated. Include ventilation, lighting, ceiling finish, wall finish, access doors, doors, power door operators, sill

(threshold), trim, accessories, and floor finish unless indicated as not work of this section. Provide horizontal sliding doors of manufacturer's standard flush panel type, with operation and number of panels as indicated. Provide manufacturer's standard protective edge trim system for door and wall panels, except as otherwise indicated.

2. Materials and Fabrication: Provide selections as indicated for each car enclosure surface; manufacturer's standards, but not less than the following:

   a. Aluminum Sills: Cast aluminum, with grooved surface, 1/4" thickness, mill finish.
   b. Plastic Laminate: High-pressure type complying with NEMA LD3, 0.05" thickness; color, texture and pattern as selected by Architect from standard products available in the industry.
   c. Fabricate car door frame integrally with front wall of car.
   d. Fabricate car with recesses and cutouts for signal equipment.
   e. Vinyl Composition Tile Floor Covering: FS SS-T-312, Type IV, Composition 1 of 2, 12" x 12" x 1/8"; color/pattern selected by Architect for available choices in tile industry.

3. Handrails: Provide stainless steel handrails, on side walls and back wall; either continuous or panelized.
4. Door Edge Protective Device: Provide retractable edge shoe on leading edges of elevator entrance doors which, upon contacting an obstruction in entrance, causes doors to stop and reopen.
5. Photo-Eye Detection Device: Provide electronic photo-eye device with timed cut-out, projecting dual light beams across car entrance, which, when interrupted, will cause closing doors to stop and reopen. Provide keyed switch in car operating panel for disconnecting photo-eye device.
6. Nudging Feature: After car doors are prevented from closing for a predetermined adjustable time period, through activation of detection device or door edge protective device, a loud buzzer shall sound and doors shall begin to close at reduced rate of speed. Doors shall continue to close unless door edge protective device is activated, which shall cause doors to reopen. Process shall repeat continuously until obstruction is removed from entrance.

O. Hoistway Entrances:

1. General: Except as otherwise indicated, provide manufacturer's standard, pre-engineered, hollow metal type, sliding, door -and-frame hoistway entrances; complete with track systems, hardware, safeties, sills and accessories. Match car enclosure doors for size, number of door panels and door panel movement. Provide frame-section size and profile to coordinate with hoistway wall construction as indicated.

a. Where gypsum-board type wall construction is indicated, fabricate frames with reinforced head sections; provide sufficient strength without support from wall lintels.

2. Materials and Fabrication: Selections indicated; manufacturer's standards, but not less than the following:

a. Doors and Frames: Type indicated in Elevator Schedule.
b. Aluminum Sills: Cast aluminum, with grooved surface, 1/4" thickness; mill finish for passenger cars; steel or cast iron for freight car.

PART 3 EXECUTION

3.01 INSPECTION: Prior to commencing elevator installation, inspect hoistways, hoistway openings, pits and machine rooms, as constructed, and verify all critical dimensions, and examine supporting structure and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 INSTALLATION OF ELEVATOR SYSTEM:

A. General: Comply with manufacturer's instructions and recommendations for work required during installation.

B. Excavation for Jack: Drill excavation in each elevator pit to accommodate installation of plunger-cylinder unit; comply with applicable requirements of EARTHWORK Section.

1. Install casings with waterproof seals at pit floor, and with waterproof, high-pressure seal at bottom of casings.

C. Install plunger-cylinder units plumb and accurately centered for elevator car position and travel; anchor securely in place.

D. Welded Construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

E. Coordination: Coordinate elevator work with work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines and levels designed by Contractor, to ensure dimensional coordination of the work.

F. Sound Isolation: Mount rotating and vibrating elevator equipment and components on vibration-absorption mounts, designed to effectively prevent transmission of vibrations to structure, and thereby eliminate sources of structure-borne noise from elevator system.

G. Install piping without routing underground, where possible; where not possible, cover underground piping with permanent protective wrapping before backfilling.

H. Lubricate operating parts of systems, including ropes, if any, as recommended by manufacturers.

J. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails, for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

K. Leveling Tolerance: 1/2", up or down, regardless of load and direction of travel.

L. Grout sills with non-staining, non-shrink grout. Set units accurately aligned with and slightly above finished floor at landings.

3.03 FIELD QUALITY CONTROL:

A. Acceptance Testing: Upon nominal completion of each elevator installation, and before permitting use of elevator (either temporary or permanent), perform acceptance tests as required and recommended by Code and also perform other tests as required by governing regulations.

B. Operating Tests: Load each elevator to its rated capacity and operate continuously for 30 minutes over its full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of pump motor during 30 minute test period. Record failures of elevator to perform as required.

C. Advise Owner, Architect and inspection department of governing agencies, in advance of dates and times tests are to be performed on elevators.

3.04 PROTECTION:

A. At times of substantial completion of elevator work (or portion thereof), provide suitable protective coverings, barriers, devices, signs or such other methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

B. Provide similar protective measures for elevator units which will be placed in temporary service, including inspection and maintenance service during period of temporary service.

3.05 INSTRUCTION AND MAINTENANCE:

A. Instruct Owners personnel in proper use, operations and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions. Confer with Owner on requirements for a complete elevator maintenance program.

B. Make a final check of each elevator operation, with Owner's personnel present and just prior to date of substantial completion. Determine that control systems and operating devices are functioning properly.

C. Continuing Maintenance: Provide a continuing maintenance proposal to Owner, in the form of a standard yearly maintenance agreement, starting on date construction contract maintenance requirements are concluded. State services, obligations, conditions and terms for agreement period, and for renewal options.

3.06 ELEVATOR SCHEDULE

A. Passenger Elevator:

1. Quality: One.
2. Capacity: 3000 lbs.
3. Speed: 125 ft. min.
4. Power Supply: Refer to Electrical Section.
5. Travel Distance: As indicated.
6. Landings Served: As indicated.
7. Operation: Selective Collective.
8. Signals: Manufacturer's standards: Stainless steel finish.
9. Car Enclosure:

    a. Platform Size: As indicated.
    b. Car Door Operation: As indicated.
    c. Ceiling: Plastic Laminate with 6 downlights.

10. Hoistway Entrance: 16 gauge steel with baked enamel finish; color as selected by Architect.
11. Additional Requirements: Emergency egress; protective pads.

END OF SECTION

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PART 1 - GENERAL

1.01 REFERENCE

A. The GENERAL DOCUMENTS, as listed on the the Table of Contents, and applicable parts of Division 1, GENERAL REQUIREMENTS, shall be included in and made a part of this Section.

1.02 DESCRIPTION OF WORK

A. Complete domestic cold water systems shall start with new connections to the existing water mains in Washington Street and Northampton Street. The systems shall connect to all plumbing fixtures and equipment including water meters.

B. Complete domestic hot water systems for Parcels 29-a, SE-70 and SE-71 shall be generated by the central gas fired storage heaters located in the boiler rooms.

C. Complete soil, waste and vent system connecting to all plumbing fixtures and equipment. Vents shall extend through roof. Soil and waste lines shall flow by gravity to a point 5'-0" outside foundation wall.

D. Complete exterior sanitary collection system including manholes and final connections to the sanitary mains in Washington Street and Northampton Street.

E. Complete gas systems starting with new connections to the existing gas mains in Washington Street and Northampton Street. Systems shall include regulators/meters assemblies and connect to all gas fired equipment. Make all necessary arrangements and pay all costs for the new exterior gas services for this project.

F. Complete interior storm water collection system connecting to all roof and deck drains. System shall flow by gravity and terminate 5'-0" outside foundation wall.

G. All plumbing fixtures, supports and related trim.

H. Insulation for all water piping.

I. Buildings shall have complete sprinkler and standpipe coverage. Systems shall consist of a combination standpipe/sprinkler system. Systems shall start with a new connection to the existing water mains located in Washington Street and Northampton Street.

Standpipes with 2-1/2" fire department and sprinkler control valve at each level.

J. Building fire protection which shall consist of a combination sprinkler, standpipe systems fed through a fire pump with jockey pump and controls. Standpipes shall be located in stairwells and interior locations as indicated, complete with 2-1/2 inch fire department valves and valved sprinkler supply branches with water flow indicator assembly continuing to sprinkler heads on each level to provide complete sprinkler and fire hose coverage. System shall start with a connection to the exterior city water main valved branch located in street, underground piping to building shall be provided with bridle rods at all bends and shut-off valve at the interior building entrance point.

K. Provide all valves specified herein and/or indicated including vacuum relief, temperature and pressure relief, shut-off, balancing, checks, drains valves, fire department valves, standpipe hose (fire department) valves, fire pump test valves, hose bibbs, pressure reducing valves, flush valves, backflow preventers, wall hydrants, plug cocks and other valves specified herein.

L. Install toilet room accessories furnished under Division 10.

M. Furnish access panels for installation by the related trades of surfaces in which they are located.

N. Provide all floor and roof drains, cleanout plates and pipe cleanouts.

O. Provide hangers, sleeves, anchors, inserts, strainers, gauges, thermometers, plus related accessories required for a complete installation of each system specified and/or indicated.

P. Provide supplementary steel for piping and equipment supports.

Q. Provide tests, balancing and sterilization of systems specified herein.

R. Provide color coding, valve tags and charts.

S. Provide operating and maintenance manuals.

T. Provide guarantee.

U. Provide shop drawings, record drawings, coordination drawings, refer to Division 1.

V. Provide required cutting and patching, refer to Division 1.

W. Provide temporary water piping system, refer to Division 1.

X. Provide required cleaning and rubbish removal, refer to Division 1.

Y. Cost of new water meters, installation, furnished and installed by City water department authority, shall be borne by this contractor.

Z. Provide special shop drawings relative to fire protection systems as follows: Before buying or installing any fire protection equipment, prepare and submit required number of approved sets of shop drawings to scale, of complete fire protection systems to

Architect. Shop drawings shall have been previously approved by I.S.O. (Insurance Service Offices) and stamped after review, by appropriate Insurance Underwriters or Authorities as required by Owner.

AA. Under this Section of the Specification, maintain standpipe coverage at all time during construction. Coverage shall consist of standpipes plugged at one floor level below progress of construction with a minimum of one 2-1/2 inch fire department valve provided on each standpipe and active at all times.

1.03 RELATED WORK SPECIFIED UNDER OTHER SECTIONS

A. Toilet Room Accessories and certain accessories specified under Division 10 shall be installed under this Section of the Specification.

B. Excavation, backfilling, exterior storm drainage, trenching, pumping, shoring and rough grading, repair of existing streets and sidewalks excavated in conjunction with installation of new Utilities shall be as specified under Division 2.

C. Painting, except as specified herein, including color coding of pipes, specified under Division 9.

D. Access panels, furnished under this Section, to be installed under the related trades of the surfaces in which they are located.

E. Electrical wiring, disconnect switches, and motor starters for all motors, unless otherwise specified herein, to be furnished and installed under Division 16.

F. Final electrical connections to fire pump, jockey pumps, hot water circulating pumps, all controls, valve monitor switches, flow indicators, bells, supervisory panels - Division 16.

G. Temporary heat, electricity, and toilet facilities, specified under Division 1.

H. Concrete thrust blocks, pits, trenches and equipment bases, including grouting of all pumps and equipment - Division 3.

I. Manholes - Division 3.

J. Fire extinguishers to be provided under Division 10.

K. Foundation drainage piping system - Division 2.

L. Condensate drains from Air Conditioning Equipment - Division 15.

M. Boiler for heating, flue pipes for gas fired hot water heaters, final connections and boiler gas supply (including approved gas train) and cold water make-up for heating system - Division 15.

N. Trash chute interior fire protection and washing systems - Division 14. Final connections to each system (water and fire protection) by the Plumbing Subcontractor.

O. Provide necessary supervision and coordination information to any other trades involved in construction to accommodate space, support or service to install plumbing - fire protection, equipment.

1.04 CODES, PERMITS AND FEES

A. Unless otherwise specified or indicated, materials and workmanship and equipment performance shall conform with the latest edition of the following standards, codes, specifications, requirements, and regulations but not limited to:

1. All applicable NFPA standards.
2. Commonwealth of Massachusetts Plumbing, Gas and Building Codes.
3. American Society of Mechanical Engineers.
4. American Society of Testing and Materials.
5. American National Standards Institute.
6. National Electrical Manufacturer's Association.
7. Underwriters' Laboratories, Inc.
8. Occupational Safety and Health Administration.
9. City of Boston, Massachusetts Ordinances.
10. American Water Works Association.
11. Compressed Gas Association.

B. Any other local codes and/or authorities (governmental or public utility) having jurisdiction including any other standards specifically indicated in other paragraphs of this Specification.

C. Under this Section of the Specifications, pay all fees, submit all necessary documents, obtain all permits and certificates and all necessary approvals from authorities (governmental or public utility) having jurisdiction, provide copies of all permits, approvals and certificates to the supervising Architect for his record. All costs for these requirements shall be borne under this Section of the Specification.

D. New Street Connections:

1. The complete cost for each new piping connection to the existing sanitary sewers and water main branches in the street shall be borne by this Contractor. Included in the cost for

each new connection shall be excavation, backfilling, pumping and shoring, valves, manholes and all necessary refinishing of the existing streets and sidewalks disturbed to perform the aforementioned work.

.05 ELECTRIC MOTORS

A. Motor shall be built in accordance with latest standards of NEMA and as specified. Motor shall be specifically and expressly wound for voltage required.

B. Motor shall be tested in accordance with standards of ANSI C50 and conform therewith for insulation resistance and dielectric strength.

C. Motor shall be provided with adequate starting and protective equipment as specified or required and with conduit terminal box of size adequate to accommodate conduits and wires as sized on electrical drawings or specified under this Section of the Specification.

D. Capacity shall be sufficient to operate associated driven devices under conditions of operation and load and with overload and at least horsepower indicated or specified. All motors shall be of the high efficiency, low energy consuming type most suitable for the application and its specific environmental location in this building. All motor replacements necessary for compliance to the application shall be at no additional cost to the Contract.

E. All motors shall be suitable for continuous duty at rated horsepower with temperature rise not to exceed 40 degrees C for drip-proof motors, 50 degrees C for splash proof motors, 55 degrees C for totally enclosed or explosion-proof motors. All motors shall be capable of 25 percent overload without overheating and suitable for operation for the ambient conditions of its specific location in the building.

F. Direct connected motor shall be furnished with adjustable base. Motors connected to driven equipment by belt or shaft shall be furnished with adjustable sliding bases, except fractional HP motors, which have slotted mounting holes.

G. All motors "rpm" shall be within the specified acceptable range to avoid noise and vibration transmission to the building structure.

H. Motors shall have nameplates giving manufacturer's name, serial number, horsepower, speed and current characteristics.

I. Motors smaller than 1/2 horsepower shall be capacitor-starter or phase type designed for 120 volts, single phase, 60 cycle operation unless otherwise specified. This shall be coordinated with work under Section 16100 Electric.

J. Motors 1/2 horespower and larger shall be squirrel cage induction type designed for 208 volts, three-phase, 60 cycle operation unless otherwise specified.

K. Installation of Motor control equipment will be indicated under Section 16010 Electric as shown on the drawings for control and operation of the plumbing - fire protection equipment.

1.06 SURVEYS AND MEASUREMENTS

A. Under this section of the Specification, base all required measurements, both horizontal and vertical, from referenced points established by the Architect and be responsible for correct laying out of the work required under this Section of the Specifications.

B. In the event of discrepency between actual measurements and those indicated, notify the Architect in writing and do not proceed with the work required under this Section of the Specification until written instructions have been issued by the Architect.

1.07 COORDINATION

A. Work shall be performed in cooperation with other trades on the project and so scheduled as to allow speedy and efficient completion of the project.

B. Furnish to all other trades advance information on location and sizes of all frames, boxes, sleeves, and openings needed for the work under this Section of the Specifications and also furnish information and shop drawings necessary to permit trades affected by the Plumbing - Fire Protection work to install their work properly coordinated and without delay.

C. Where there is evidence that work installed under this Section of the Specifications interferes with the work of other trades, assist in working out space conditions to make satisfactory adjustments.

D. With the approval of the Architect, and without extra cost to the Owner, make reasonable modifications in work specified under this Section of the Specifications required to coordinate with normal structural interferences, or for proper execution of specified work.

E. If work is installed before coordinating with other trades, so as to cause interference with the work of such trades, make all necessary changes in work under this Section of the Specifications at no additional cost to the Contract.

F. Protect all materials and work of other trades from damage that may be caused by the work required under this Section of the Specifications and be responsible for repairing any damages caused by such work at no additional cost to the Contract.

1.08 CUTTING AND PATCHING

A. When, in order to accommodate the work required under this Section of the Specifications, finished materials of other trades must be cut or fitted in the shop, furnish the necessary drawings for transmittal to the trades whose materials must be cut or fitted.

B. Do all drilling and cutting of holes in concrete walls and floors for the installation of sleeves and supports provided under this Section of the Specification.

C. Pay costs for additional cutting and patching caused by ill-timed, incorrectly preset materials or defective plumbing and fire protection work, or plumbing and fire protection work not conforming to Contract Documents, including costs for additional services of Architect, if work under this Section of the Specifications is responsible for ill-timed, rejected, incorrectly located, or nonconforming work.

1.09 ACCESSIBILITY

A. All work provided under this Section of the Specification shall be installed so that parts requiring periodic inspection, operation, maintenance and repair are readily accessible. Minor deviations from the drawings may be made to accomplish this, but changes of substantial magnitude shall not be made prior to written approval from Architect.

1.10 ACCESS PANELS

A. Furnish access panels for installation in walls, ceilings and floors at locations indicated or as specified herein to permit access for adjustment, removal and replacement and servicing of all concealed equipment and materials provided under this Section of the Specifications.

B. Access panels will be installed under the Section of the related trades of the finished surfaces in which they are located.

C. All access panels shall be located in a workmanlike manner, also in closets, storage rooms and/or other non-public areas, positioned so that the equipment can be easily reached, and the size shall be sufficient for this purpose (min. 16 inch x 16 inch). When access panels are required in corridors, lobby or other habitable areas, they will be located as directed by the Architect.

D. Access panels shall be prime painted and provided with cylinder lock and two keys as manufactured by Milcor, Inland Steel, Miami Carey or approved equal.

1.	Dry Wall Surfaces	Milcor Type DW
2.	Masonry Construction	Milcor Type M

3.	Acoustical Tile Ceiling	Milcor Type A
4.	Plastered Surfaces	Milcor Type K

E. Access panel shop drawings shall be submitted to the Architect for approval.

1.11 FIREPROOFING

A. All clips, hangers, clamps, supports and other attachments to the fire rated structure, required for work provided under this Section of the Specifications, shall be coordinated with concrete and structural steel trades in order to avoid any damage to the fireproofing.

B. All piping and other items which would interfere with the proper application of fireproofing shall be installed after the application of fireproofing.

C. Pay the cost of all additional patching and repairing of fireproofing due to cutting or damage to the fireproofing by the installation of work provided under this Section of the Specifications.

1.12 PORTABLE OR DETACHABLE PARTS

A. For all work provided under this Section of the Specifications, retain in possession and be responsible for all portable and/or detachable parts and portions of the installation and all other devices or materials that are relative to and necessary for proper operation and maintenance of the plumbing - fire protection systems until final completion of the Contract, such items shall be given to the Architect for transferal to the Owner.

B. Replace, free of cost, all stolen, lost or damaged items provided under this Section of the Specifications relative to the installation and operation of the plumbing - fire protection systems before the building is accepted by the Owner.

1.13 FIELD DRILLING

A. Field drilling (core drilling) when required, shall be performed under this Section of the Specifications, after receipt of approval by the Architect.

1.14 TOOLS, EQUIPMENT, STAGING AND HOISTING EQUIPMENT

A. Necessary tools and equipment such as pipe bending machines or staging for erection of equipment shall be furnished at job site under this Section of the Specifications for fabrication and erecting all related equipment covered by this Section of the Specification.

B. Refer to Division 1 for provisions in hoisting.

C. Concrete bases and supports for equipment and piping; including grouting will be furnished and installed under Division 3.

1. Under this Section of the Specification, furnish required foundation sizes, bolts, washers, sleeves, plates, templates for plumbing and fire protection equipment.

2. The size of the foundation bolts shall be as recommended by the manufacturer.

3. Equipment shall be set on the foundation and shimmed level with steel shims, then grouted for uniform bearing.

1.15 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS

A. Provide all supplementary steel, factory fabricated channels and supports required for proper installation, mounting and support of all piping and equipment provided under this Section of the Specification.

B. Supplementary steel and factory fabricated channels shall be firmly connnected to building construction in a manner approved by the Architect; as shown on the drawings or hereinafter specified.

C. The type and size of the supporting channels and supplementary steel provided under this Section of theSpecifications shall accommodate all deflections in conformance with the manufacturer's requirements for the specific loading on the system installed therein.

D. All supplementary steel and factory fabricated channels shall be installed in a neat and workmanlike manner parallel to the walls, floors and ceiling construction. All turns shall be made with 90 degree and 45 degree fittings, as required to suit the construction and installation conditions.

E. All supplementary steel including factory fabricated channels, supports and fittings shall be Underwriters' Laboratories, Inc. approved, shall be galvanized steel, and shall be manufactured by Unistrut, Powerstrut or approved equal.

1.16 CROSS AND INTER-CONNECTIONS

A. No plumbing fixtures, equipment, devices or piping shall be installed which will provide a cross or inter-connection between a distribution water supply for drinking or domestic purposes and nonpotable supply or a drainage system soil or waste pipe which will permit or make possible the backflow of sewerage, polluted water or waste into the domestic water supply system.

1.17 TYPICAL DETAILS

A. Typical details where shown on the drawings shall apply to each and every item of the plumbing-fire protection work where such items are applicable. They are not repeated in full on the drawing, which in many cases are diagrammatic only, but with the intention that such details shall be incorporated in full. Any alternate methods proposed to be provided under this Section of the Specifications shall have prior written approval from the Architect before installation.

1.18 SHOP DRAWINGS

A. Shop drawings shall be submitted in accordance with requirements specified in Division 1.

   1. Where, under this Section of the Specification, a proposal has been made to use an item of material or equipment other than that shown or specified in the Contract Documents, this Contractor shall assume the cost of and entire responsibility of coordination with all other trades involved. In addition, make such arrangements and assume costs occasioned by changes in the work of other trades that may be required in order to install the approved substitution; such changes shall not be a matter for subsequent Change Order for extra work to the Contract.

B. List of Shop Drawings:

   1. Piping, fittings and accessories.

   2. Valves and cocks including vacuum, pressure and temperature relief valves, balancing valves, check valves, drain valves, wall hydrants, standpipe hose valve, fire department connection, roof manifold and flow control fittings.

   3. Hangers and supports including supplementary steel.

   4. Thermometers and gauges.

   5. Strainers.

   6. Flow switches and monitor switches.

   7. Sprinkler heads, sprinkler layouts and hydraulic calculations.

   8. Backflow preventors and water meter.

   9. Plumbing fixtures and related trim.

   10. Insulation.

   11. Hot water heaters and recirculating pump.

   12. Floor drains, roof drains and cleanouts.

   13. Access panels.

14. Sleeves and escutcheons.

15. Test certificates.

16. Fire Pump, Jockey Pump and all Controls.

17. Fire pump test valves, test hose cabinet, and wall connection.

18. Fire department valves.

19. All wiring diagrams indicating the sequence of operation, sequence of interlocking and operation of alarms.

20. Sump pumps.

1.19 DEFINITIONS

A. As used in this Section, the following terms are understood to have the following meaning:

1. The Contractor shall mean the Trade Contractor.

2. Furnish shall mean purchase and deliver to the project site, complete with every necessary appurtenance and support.

3. Install shall mean unload at the delivery point at the site and perform all work necesary to establish secure mounting and proper location in the project.

4. Provide shall mean "Furnish" and "Install".

5. Work means all labor, materials, equipment, apparatus, controls, accessories, and all other items required for a proper and complete installation.

6. Piping includes in addition to pipe or tubing, all fittings, flanges, unions, valves, strainers, drains, hangers and other accessories relative to such piping.

7. Concealed means hidden from sight as in service strips of kitchen, in chases, furred spaces, shafts, hung ceilings, embedded in construction.

8. Exposed means not installed underground or concealed as defined above.

9. Any work by others means work not provided under this Section of the Specification but work furnished and/or installed under other Sections of the Specification within this Contract.

10. Coordinate means all plumbing-fire protection work provided under this Section of the Specification shall be in compliance with work of other trades.

11. O.P. means systems operating pressure.

12. Bypass, where used in connection with piping shall include one globe valve for throttling, two gate valves for shutoff, pipe and fittings.

13. Indicated shall mean Indicated on the Contract Drawings.

14. Herein shall mean the Contents of a particular Section where this term appears.

1.20 TECHNICAL ABBREVIATIONS

A.	TDH	-	Total Dynamic Head.
B.	C.I.	-	Cast Iron.
C.	RPM	-	Revolutions Per Minute.
D.	HP	-	Horsepower.
E.	GPM	-	Gallons Per Minute.
F.	PSIG	-	Pounds Per Square Inch Gauge.
G.	^oF	-	Degrees Fahrenheit.
H.	^oC	-	Degrees Centrigrade.
I.	CFM	-	Cubic Feet Per Minute.
J.	KW	-	Kilowatt.

1.21 DRAWINGS, SPECIFICATIONS AND COORDINATION

A. It is the intention of these Contract Documents to call for complete, finished work, fully tested and ready for continuous operation.

B. Any apparatus, appliance, material or work not shown on the drawings but mentioned in the specifications, or vice versa, or incidental accessories necessary to make work complete and perfect in all respects and ready for operation even if not particularly specified, shall be furnished, delivered and installed under this Section of the Specifications without additional cost to the Contract.

C. Should there appear to be discrepancies or question of intent in the work to be done under this Section of the Specifications, refer the matter to the Architect for decision before ordering any materials, or equipment or before start of any related work. Interpretations of the Architect shall be final, conclusive and binding.

D. Drawings are generally diagrammatic and are intended to convey scope of work and indicated general arrangements of equipment, piping, fixtures, etc.

E. Location of items indicated, that are not definitely fixed by dimensions are approximate only. Exact locations necessary to secure best conditions and results must be determined at the project and shall have the Architect's approval before being installed.

F. Follow drawings in layout work and check drawings of other trades to verify spaces in which work provided under this Section of the Specifications will be installed and maintain maximum headroom or space conditions at all points, where headroom or space conditions appear inadequate, notify the Architect before proceeding.

G. Attend regular coordination and job progress meetings as required by the Architect.

H. Provide and maintain on site a field office and storage facilities as specified under Division 1.

I. Maintain premises and public properties free from accumulations of waste, debris, and rubbish caused by Plumbing/Fire Protection construction work.

J. Maintain a clean, dry, legible and current record drawings as specified under Division 1.

1.22 SUBCONTRACTS

A. Wherever hereinafter guarantees of durability, operating capacity, proper functioning of equipment and the like are called for in this Section of the Specifications or wherever it is specified herein that the manufacturers shall furnish detail drawings, test certificates, or performance curves, that the manufacturer shall supervise the installation, keep it in repair for a stated period, or render other similar services, responsibility for the performance of the specified service under the actual conditions of installation shall be included as a part of this Section of the Specifications.

B. The same shall apply to cases where special adjustment by manufacturer or other services are necessary to insure proper and efficient functioning of apparatus, even though not specifically hereinafter called for.

C. In any case where employees, provided under this Section of the Specification, cannot adequately perform the above described service, such performance required by subcontractors, manufacturers, etc., and subsequently payment of any additional fees required therefore shall be included as a part of this Section of the Specifications.

D. Where due to Union Regulations or Trade Agreements, any of the work shown on the Drawings or specified herein is considered work of other trades, the work in question shall be subcontracted as a part of this Section of the Specifications and responsibility for the complete installation shall be included in this Section of the Specifications.

1.23 COORDINATION AND FABRICATION DRAWINGS

A. Refer to Division 1 for coordination drawing requirements.

1.24 SPRINKLER/STANDPIPE SYSTEMS CRITERIA

A. Provide complete combination sprinkler/standpipe pipe system conforming to NFPA Standards #13, 14 and 20, and the requirements of the Commonwealth of Massachusetts; requirements of the Building Department and the local Fire Department and approved by Owner's insuring agency, I.S.O. (Insurance Service Offices). Systems shall consist of the following:

1. Combination standpipe/sprinkler risers and sprinkler risers located in the stair cores.

2. Provide a sprinkler supply branch at each floor off the standpipe risers in stairways. Each riser branch per floor shall include a water flow indicator - inspector's test control valve assembly, including an OS & Y valve with monitor switch.

3. Provide on each floor of each stairway, as indicated, an approved Class I exposed 2-1/2" brass fire department valve with 1-1/2" reducer, cap and chain.

4. Provide siamese wall mounted fire department connections.

5. The entire building shall be sprinklered except in Electrical, Telephone and Elevator Machine Rooms. Provide approved type shields to keep water from discharging directly on electrical and telephone equipment in all other parts of the building.

6. All habitable floor levels shall be protected by light hazard wet pipe sprinkler systems.

7. Sprinkler heads in areas with hung ceilings shall be 165 degrees F, chrome plated, pendant flush with ceiling type heads.

8. Sprinkler heads in unfinished areas without ceilings shall be 165 degrees F, brass upright type. Heads in finished areas without ceiling shall be 165 degrees F. Chrome plated sidewall type.

9. Provide a valved head in elevator shaft. Each valve shall be individually controlled and identified with a metal tag chained to its respective valve.

10. Provide a separate sprinkler system to serve trash chute and trash room at its base.

11. Provide spare sprinkler heads in a cabinet, with signs and other identification markings as required.

B. The location and spacing of sprinkler heads shall be as symmetrical as practical and as required to conform to codes. Sprinkler heads shall not interfere with ceiling suspension system (grid), lighting fixtures, diffusers and partitions. Heads must be reasonably aligned in both directions in all ceiling tiles in all areas. In areas without ceiling tiles, heads must be reasonally aligned in both directions. Pipe shall be run concealed in areas with suspended ceilings and coordinated with piping, conduit and ductwork installations of other trades.

C. Hydraulic calculations shall be submitted to the Owner's Insurers with shop drawings and specifications and shall be approved by the Insurers. Two copies of the approvals from the Insurers shall be forwarded to the Architect for their records.

D. During preparation of the shop drawings, this Trade Contractor shall consult with the Architect and with other Trade Contractors regarding the installation and location of piping, sprinkler heads and devices so that the work may be installed without interfering with the work of others. Additional field coordination shall be furnished by this Contractor when the need arises. Should conflicts arise that cannot be resolved between the various Trade Contractors, these conflicts are to be immediately brought to the attention of the Architect in writing.

E. This Contractor shall deliver to the Architect all certificates of inspections and approvals obtained from all governmental departments having jurisdiction and from the Owner's insuring agency before the certificates for final payment will be given.

F. This Trade Contractor shall be fully qualified to perform this installation as evidenced by a minimum of five years experience and a record of similar installations. This Trade Contractor shall be approved by the Architect.

1.25 STREET SERVICES

A. The sanitary exterior sewers from the property line to the existing sewer (including final connection) when required shall be installed by a Contractor licensed by the city. Costs for the licensed drain laying work specified herein shall be included in this Contractors bid price.

B. Domestic water and fire service connections to the street mains shall be furnished by this Contractor and installed by a person or persons designated by the city Water Department. All costs for the installation including new valves shall be borne by this Contractor and included in his Contract bid price.

C. Cost of supervision, by city water and sewer department authorities, of new water and sanitary sewer final connections to existing street utilities shall be borne by this Trade Contractor.

PART 2 - PRODUCTS

2.01 PIPE, FITTINGS AND JOINTS

A. Pipe and fittings shall conform to the latest ANSI, ASTM, NFPA and AWWA Standards including latest amendments.

B. Each length of pipe, each fitting, trap, material and/or device used in the respective system shall have cast, stamped or indelibly marked on it, the maker's name or mark, weight and quality of the product when such marking is required by the approved standard that applies.

C. Storm and Sanitary Drainage Piping:

1. Interior underground sanitary (soil, waste and vent) and storm piping to five feet outside each building wall, unless otherwise specified herein or indicated on the drawings, shall be be service weight cast iron hub and spigot soil pipe and fittings. Piping fittings shall be factory coated. Service weight soil pipe and fittings shall conform to ASTM Specifications A74 and ANSI Standards A112.5.1.

2. Interior sanitary (soil, waste and vent) and storm piping, not buried 1-1/2" and larger, shall be no-hub service weight except at urinals which shall be extra heavy cast iron hub and spigot with lead and oakum joints. Exposed waste and vent piping in Toilet Rooms shall be chrome plated nickel finish.

3. Indirect waste piping shall be Type "DWV" copper tubing with wrought copper solder joint drainage type fittings.

D. Sanitary Sewer and Storm Piping:

1. All exterior storm and sanitary sewer piping from ten feet outside building wall shall be PVC SDR35. PVC sewer pipe and fittings conforming to SDR-35.

E. Water Piping:

1. Interior above ground domestic cold, and hot water supply and return piping shall be Type "L" hard drawn copper tubing with wrought copper solder joint type or cast brass sweat fittings conforming to ASTM Specification B-88, ANSI Standards B16.22, B16.18, and B16.18a, respectively. Flanged fittings shall be Class 150 cast bronze conforming to ANSI Standard B16.24. Exposed water piping in Toilet Rooms shall be chromed plated nickel finish.

2. Exterior buried cold water and fire protection pipe shall be bituminous coated (exterior) ductile iron, cement lined Class 52 with mechanical joints and retainer glands. All pipe and fittings buried in the ground shall be encased in loose 8 mil thick polyethylene film sleeve that complies with ANSI A21.5.

Exterior buried cold water piping serving the townhouses shall be Type "K" soft rolled copper pipe with flared fittings.

3. Sprinkler mains, branches and standpipe system piping shall be Schedule 40 black steel pipe with extra heavy flanged, threaded or victaulic joints and fittings. Schedule 40 black steel pipe with 250 pound threaded type cast iron fittings as approved by NFPA.

F. Gas Piping:

1. Gas piping shall be Schedule 40 black steel pipe with threaded ends and 150 pound black malleable iron flat band threaded fittings conforming to ANSI Standard B16.3.

G. Unions and Flanges:

1. Unless otherwise specified herein, unions, for copper and brass piping; two inches and smaller in diameter shall be one hundred twenty-five pound (steam working pressure) brass ground joint type; larger than two inches in diameter shall be one hundred fifty pound flat faced cast brass flanges conforming to ANSI Standard B16.24. Flanges shall have copper clad steel bolts and nuts and 1/16 inch minimum thickness red rubber full faced gaskets.

2. Where brass flanges and ferrous flanges are to be joined, ferrous flanges shall be full faced.

3. Flanges in gas piping shall be 150 pound screw type with raised face with code approved gaskets.

4. Mating of ferrous and non-ferrous flanges shall be separated with rubber gaskets (1/16 inch minimum thickness) and teflon liners installed in the bolt holes. Bolt holes shall be drilled to receive the teflon liners. Physical contact between the ferrous and non-ferrous flanges including the bolts, nuts and washers will not be permitted.

H. Nipples:

1. Close and shoulder nipples shall be of corresponding materials as specified for the respective piping system and shall be extra heavy.

I. Joints:

1. Joints in cast iron soil pipe above ground shall be made using "Clamp-All" compression type coupling consisting of a neoprene collar, stainless steel coupling with stainless steel bolts and nuts all assembled to provide seal.

2. Joints in cast iron soil piping below ground shall be code approved compression type, made with rubber gaskets conforming

to ASTM Specification C564. Joints in cast iron soil pipe and fittings using a double seal, compression type molded neoprene gasket shall be provided with a modified hub as required to provide a positive seal.

3. Joints in copper tubing except as otherwise specified herein shall be made according to manufacturer's specifications using sweat fittings and 95-5 tin/antimony solder and non-corrosive flux.

4. Steel, copper and brass pipe and fittings with screwed ends shall have IPS threads cut clean and true and in conformance with the ANSI Specifications B2-1 for taper threads.

5. Joints between steel or copper, and cast iron shall be made with Manhoff Fittings screwed into threaded pipe and caulked into the cast iron pipe.

6. Connections between earthenware of any fixture and flanges in soil and waste piping shall be made absolutely gas and watertight with closet setting compounds and gaskets which must be absolutely gas and fireproof, watertight, stainproof, containing neither oil nor asphaltum and which will not rot, harden or dry under any extreme climatic change, and must adhere on wet surfaces.

7. Before assembly of roll grooved type couplings and fittings on sprinkler - fire line piping, lightly coat pipe ends and outside of gaskets with cup grease or graphite to facilitate installation. Pipe roll grooving shall be in accordance with manufacturer's specifications contained in their latest published literature and NFPA 13.

8. Heat fusion joints in polypropylene pipe shall be made in accordance with manufacturer's instructions.

2.02 PIPE, EQUIPMENT AND VALVE IDENTIFICATION

A. General:

1. All pipe markers, bands, valve tags and equipment identification plates shall be as manufactured by W.H. Brady, Westline Products, Seton Nameplate Company or as approved equal by the Architect.

B. Piping:

1. Name of the service shall be printed in black letters, not less than 2 inches high for piping 3 inches and larger and one inch in height for piping 2-1/2 inches and smaller.

2. Legends, arrows and color band background shall conform to ANSI Standard A13.1 covering "Identification of Piping Systems."

C. Equipment:

1. Nameplates shall be made of black surface white core laminated bakelite with indented letters.

2. Nameplate shall be a minimum of 3 inches long by 1-1/2 inches wide and bear the equipment name as designated in these Specifications.

3. Equipment identification designations shall be taken from equipment schedules as indicated on the drawings or specified herein.

D. Valve Tags:

1. All valves on pipes of every description shall have neat, circular brass valve tags of at least 1-1/2 inches in diameter, attached with brass hook to each valve stem. Stamp on these valve tags in letters as large as practical the number of the valve and the service such as "H.W.", "C.W.", for hot water, cold water, respectively. The numbers of each service shall be consecutive.

2. All valves on equipment, tanks and pumps shall be numbered by 3 inch diameter red metal discs with white numbers 2 inches high secured to stem of valves by means of brass hooks or small solid link brass chain.

2.03 VALVES AND SUNDRIES

A. General:

1. All gate and globe valves shall be designed for repacking under pressure when fully opened, and shall be equipped with packing suitable for the intended service. When the valve is fully opened, the backseat shall protect the packing and the stem threads from the fluid. All gate and globe valves shall have a gland follower. The pressure temperature rating of valves shall be not less than the design criteria applicable to all components of the system.

2. Bronze valves with the basic saturated steam rating of 125 psi or 150 psi shall have pressure containing parts of a material having at least the physical properties of ASTM Specification B-62. Metallic seated bronze globe, angle, check and gate valves with a basic steam rating of 200 to 300 psi shall have pressure containing parts of material conforming to ASTM Specification B-61 for temperatures to 500 degrees F.

3. Pressure containing parts of iron body valves shall be of material conforming to ASTM Specification A-126 Grade B. If the wedge in OS & Y gate valves is fastened to the stem by threads, it shall be secured by a nickel alloy or monel pin.

4. Face to face and end to end dimensions of iron body valves shall conform to ANSI B16.10. Design, workmanship, materials, and testing shall conform to MSS-SP-70 and MSS-SP-71 and MSS-SP-85. (Manufacturers Standardization Society of the Valve and Fitting Industry.)

5. Stems of bronze valves shall be of ASTM B-584 Alloy 876 (cast silicon brass). Stems of iron body bronze mounted valves shall be of ASTM B-371 Alloy 694 (rolled silicon brass), or other material equally resistant to dezincification.

6. All pressure castings shall be free of any impregnating materials.

7. All valves installed in boiler room must conform to ASME boiler code specifications.

8. All valves on fire protection lines shall be approved by the National Board of Fire Underwriters, or the Associated Factory Mutual Fire Insurance Companies. All hose valves shall have threads on outlets conforming to the local fire department specifications.

9. Each valve is to be given shell and seat tests by the manufacturer and will carry a permanently affixed indication that tests have been successfully completed.

10. Insofar as possible, all valves of the same type shall be of the same manufacturer. Before purchasing any valve, Contractor shall submit for approval the name of the manufacturer, the figure number which he proposes to furnish, and engineering data on each figure number, if not using those specified. The intent of this requirement is to obtain the most suitable valve for each service. Non-standard valves will not be considered.

11. Globe valves shall be used to throttle or control the flow.

12. Gate valves shall be used as "SHUT-OFF".

13. Manufacturers valve numbers listed herein is intended only as a guide for the type and quality to be provided under this Section of the Specifications.

B. Gate Valves:

1. Gate valves shall be of the solid wedge type, designed and manufactured in such a way that seating surfaces are prevented from contacting until near the point of closure. Valves 2" and smaller shall be bronze body screw in bonnet, non rising stem, inside screw, with threaded or solder end to suit service. Valves 2-1/2" and larger shall be flanged, and unless otherwise specified shall be bolted bonnet, non rising stem, cast iron body, bronze trim and replaceable seats.

Class 150:

2" and smaller - 150 psi steam, 300 psi W.O.G.

	Jenkins Bros.
Threaded	Fig. 370
Soldered	Fig. 1240

2-1/2" and larger - 125 psi steam, 200 psi W.O.G.

Flanged	Fig. 326

C. Globe Valves:

1. Globe valves 2" and smaller shall be bronze body and trim, threaded or solder end, to suit service. Globe valves 2-1/2" and larger shall be flanged, bolted bonnet, regrind renew bronze disc and seat ring, unless otherwise specified. Where composition discs are used the disc shall be suitable for the intended service.

Class 150:

2" and smaller - 150 psi steam, 300 psi W.O.G.

	Jenkins Bros.
Threaded	Fig. 106-A
Soldered	Fig. 1200

2-1/2" and larger - 125 psi steam, 200 psi W.O.G.

Flanged	Fig. 613

D. Check Valves:

1. Unless a composition disc is specified, swing check valves 2" and smaller shall be bronze body and trim, regrinding, with seating angle 40 to 45 degrees. A stop plug is required as a renewable stop for the hanger, unless otherwise specified. Disc and hanger shall be separate parts, and the disc shall be free to rotate. Hanger pins shall be supported on both ends by removable side plugs, and have a screw in cap.

2. Check valves 2-1/2" and larger shall be iron body, bronze trim, flanged, swing type, bolted cover, regrind renew bronze disc and seat ring. Disc and hanger shall be separate parts, and the disc shall be free to rotate. Hanger pins shall be supported on both ends by removable side plugs.

Class 150:

2" and smaller - 150 psi steam, 300 psi W.O.G.

	Jenkins Bros.
Threaded	Fig. 92-A
Soldered	Fig. 1222

2-1/2" and larger - 125 psi steam, 200 psi W.O.G.

Flanged	Fig. 624

E. Drain Valves:

1. Drain valves shall be 3/4" size, 300 psi W.O.G. bronze body, with 3/4" hose outlet, National Standard threads, with bronze cap and chain attached.

   Jenkins Bros. Fig. 113 N Globe, Fig. 372 N Gate.

F. Standpipe and Sprinkler System Valves:

1. Shut-off valves shall be located in conveniently accessible positions and shall be of the OS & Y gate type.

2. Shut-off valves 4 inches and larger shall have the word "open" cast on the valve as well as an arrow to indicate which direction the valve shall be turned. The name of the maker and the guaranteed working pressure shall be stamped on each valve.

3. Valves 2 inches and smaller shall be screwed-end ball valves equal to Worcester Miser three-piece steel body, stainless steel ball and stem, TFE seats, lever handle, color coded, rated for one hundred seventy-five pound working pressure and conform to Factory Mutual and Underwriters' Associations' specifications.

4. Valves 2-1/2 inches and larger unless otherwise specified herein shall be OS & Y gate valves, equal to Kennedy Fig. 67 with screwed ends for valves smaller than 4 inches and Fig. 68 for valves 4 inches and larger, Underwriters' approved, for one hundred seventy-five pound WOG working pressure.

5. The valves shall have rough body with bronze finished trimmings.

6. Check valves shall be provided where specified or indicated on the drawings and in accordance with NFPA pamphlets No. 13, 14 and 20. Check valves shall be Underwriters' approved horizontal swing type with cast iron bodies bronze seat and disc and shall have the name of the maker and the guaranteed working pressure stamped or cast on valve body. Valves shall be rated for a working pressure of one hundred seventy-five pounds per square inch gauge and shall be tested to a pressure of three hundred pounds per square inch gauge. Check valves in the piping from the exterior fire department connections shall be provided with an Underwriters' approved 3/4 inch ball drip,

pipe to the sprinkler system drain. Kennedy UL listed, FM approved, wafer type with stainless steel hinge pin and spring, Buna-N, O rings and seal or approved equal.

G. Gas System Valves:

1. Valves - 3 inches and smaller unless otherwise specified herein shall be semi-steel tapered, teflon coated, lubricated plug valves, screw gland type, 200 pound WOG working pressure, 400 pound test, threaded ends and wrench operated, Rockwell Nordstrom Fig. 114, or approved equal.

2. Valves - 4 inches and larger shall be semi-steel tapered, teflon coated, lubricated plug valves, bolted gland type 200 pound WOG working pressure, 400 pound test, flanged ends and wrench operated, Rockwell Fig. 143, or approved equal.

3. Each shut-off valve shall be provided with the manufacturers standard size wrench for that particular valve installed.

H. Sundries:

1. Vacuum breakers shall be full size and equal to Watts Regulator Company No. 288A vacuum breaker. Hose bibb vacuum breakers equal to Watts No. 8A.

2. Trap primers shall be equal to Josam Series 88250.

3. Hose bibbs shall be equal to the following:

   Type 1 (Toilet Rooms) Chicago NO. 952 (1/2")
   Type 2 (Mechanical Rooms) Chicago No. 998 (3/4")

4. Reduced pressure backflow preventor shall be equal to Watts Series 909S with strainer, sizes as shown on drawings and Commonwealth of Massachusetts approved.

5. Shock Absorbers shall be equal to Josam series #1485 Absorbatron installed where indicated and in accordance with "Standard P.D.I. - WH201".

2.04 DRAINS - FLOOR AND ROOF

A. Manufacturer's catalog numbers specified herein for drains are intended only as a guide for the type and quality to be furnished and provided (floor drains) by this Contractor. Refer to drawings for sizes.

1. Floor drain, Type A, (Mechanical Rooms) shall be equal to Josam 32110-7 floor drain with nonpuncturing flashing collar and ductile iron grate.

2. Floor drain, Type B, (Trash Room) shall be equal to Josam Series 36000-7 with sediment bucket and ductile iron grate.

3. Roof drain, Type A, shall be equal to Josam 22004-3 coated cast iron roof drain with locking dome, nonpuncturing clamp ring with integral gravel stop, medium sump with anchor lugs, roof flange and bottom outlet.

4. Roof drain, Type B, shall be equal to Josam 24710-3 coated cast iron roof drain removable sloping bronze grate, flashing clamp, shallow sump with flashing flange and 45° side outlet threaded connection.

2.05 HANGERS AND ACCESSORIES

A. Carpenter Patterson Catalog numbers specified herein are intended only as a guide for the type and quality to be provided.

B. Friction clamps shall be equal to Figures 126 or 126 CT for iron, steel or copper pipe.

C. Clevis type hanger shall be equal to Figures 100 or 100 CT for iron, steel or copper.

D. Hangers for uncovered (uninsulated) copper and brass piping shall be factory applied copper plated steel Clevis hangers, Fig. 100 CT, rods and nuts used with these hangers shall also be factory applied copper plated.

E. Where three or more pipes are running parallel to each other, factory fabricated gang type hangers with pipe saddle clips or rollers may be used in lieu of the hereinbefore specified Clevis hangers. These hangers shall be sized to provide for insulation protectors as hereinafter specfied. Pipe saddle clips shall be not less than 16 gauge metal and shall be copper when installed with uninsulated copper or brass piping, insulation protectors shall be provided at each set of rollers and filled with a section of heavy density fiberglass pipe covering specified hereinafter. (Refer to Paragraph 2.07). Fig. 342 sized to suit loading with hanger rods and nuts.

F. Extension type split ring hangers with wall plates shall be equal to Figures 81, 81 CT, 90, 90 CT and 85, 85 CT plates for iron, steel and copper respectively.

G. All horizontal piping shall be suspended from the building by mild steel rod connecting the pipe hanger to inserts, beam clamps, and angle brackets as required by the building construction in accordance with thhe following:

Pipe Size In Inches	3/4 to 2	2-1/2 to 3-1/2	4 to 5	6	8 to 12
Rod Diameter In Inches	3/8	1/2	5/8	3/4	7/8

H. Hanger rods for other installations shall be sized in accordance with the recommended load capacities of ASTM Specifications Designation A-107, latest amendment.

I. Insulation protectors (shields) for horizontal piping shall be constructed of galvanized steel formed to a 180 degree arc and 12 inches long, equal to Figure 265P, 18 gauge type H for hangers 5 inches in size and smaller, 16 gauge for hangers larger than 5 inches in size.

J. Exposed rods, clamps and hangers in finished areas shall be electrogalvanized coated.

K. Refer to Part 3, "GENERAL INSTALLATION REQUIREMENT" for piping installations belowground.

2.06 SLEEVES, INSERTS AND ESCUTCHEONS

A. All pipes passing through floors, walls, or partitions shall be provided with sleeves having an internal diameter one inch larger than the outside diameter of the pipe or insulation on covered lines.

B. Sleeves through outside walls shall be Schedule 40 black steel pipe with a 150 pound black steel slip on welding flanges, welded at the center of the sleeve and shall be painted with one coat of bitumastic paint, inside and outside.

C. Sleeves through masonry floors and interior masonry walls shall be Schedule 40 black steel pipe.

D. Sleeves through outside walls shall be provided with pipe to wall penetration closures equal to Link-Seal Thunderline Corporation. Seals shall be mechanical type of interlocking rubber links shaped to fill space between pipe and sleeve. Links shall be assembled with bolts to form a belt around the pipe with pressure plate under each bolt head and nut. After seal assembly is positioned, tightening of bolts will provide watertight seal. This Contractor shall determine the required inside diameter of each individual sleeve before ordering, fabricating or installing. The inside diameter of each sleeve shall be sized as recommended by the manufacturer to fit the pipe and Link-Seal to assure a watertight joint.

E. Sleeves through interior non-masonry walls or partitions shall be 22 gauge galvanized sheet steel.

F. Inserts shall be individual or strip type of pressed steel construction with accommodation for removable nuts and threaded rods up to 3/4 inch diameter, permitting lateral adjustment. Individual inserts shall have an opening at the top to allow reinforcing rods up to 1/2 inch diameter to be passed through the insert body. Strip inserts shall have attached rods with hooked ends to allow fastening to reinforcing rods.

G. Unless otherwise specified herein, escutcheons shall be cast brass chrome plated type and provided with a set screw to properly hold escutcheon in place.

2.07 PIPE COVERING

A. General: Pipe covering specified herein for piping systems shall be provided in strict accordance with the manufacturer's printed instructions, the best practice of the trade and to the full intent of this Specification.

1. All sealers, tapes, adhesives and mastics used in conjuction with the installation of the pipe covering specified herein shall possess the maximum possible fire-safe qualities available and shall be of a type approved by Factory Mutual, Factory Insurance Association or National Fire Protection Association.

2. Valves, fittings, flanges and accessories shall have the same thickness of pipe covering applied as the adjacent pipe. Pipe covering for these items shall be factory molded type Zeston or approved equal.

3. Where mineral cement is installed on roof drain bodies the thickness shall be equal to the covering on the adjoining pipe. The cement shall be neatly troweled on. Over the cement, furnish and install a fire retardant glass cloth jacket, which shall be embedded in a fire retardant vapor-proof adhesive with a three inch minimum overlap at the seams. The glass cloth jacket shall be smoothed out during the application to avoid wrinkles and gaps.

4. Field applied glass cloth jacket shall be finished with a fire resistant coating having a vapor transmission of not more than 1.0 perm.

5. Longitudinal seams and four inch wide end joints sealing strips shall be sealed with a fire retardant, vapor barrier adhesive.

6. Provide at each pipe hanger and/or pipe support on covered lines a section of heavy density (7.5 pounds per cubic foot) fiberglass sectional pipe covering in lieu of the fiberglass covering specified herein. The inserted section at each hanger (including sheet-metal saddles) shall be of the same thickness as the adjacent pipe covering and finished as specified herein for fittings.

B. Interior Cold Water, and Hot Water Piping:

1. All interior cold water, hot water, and hot water return piping shall be covered with one inch thick fiberglass covering as specified herein for interior storm drainage piping.

Exposed water piping shall be provided with an additional field applied glass mesh cloth jacket and sealed as specified herein. Insulation shall be continuous through sleeves.

2. Ends of insulation at termination points and at pipe supports shall be sealed to the pipe with a brush coat of vapor barrier coating.

2.08 FIRE PUMP SYSTEM (TWO REQUIRED)

A. General:

1. Provide where indicated; Underwriters' Laboratories, Inc. listed and Associated Factory Mutual Fire Insurance Companies two fully approved (where applicable) fire pump systems complete with pumps, driver,s controllers, accessories, jockey pumps and controls. Systems shall be an Peerless Fire Pump System or equal and meet all the requirements of NFPA Pamphlet No. 20.

B. Fire Pump:

1. Pump shall be designed to deliver 750 GPM when operating at 150 PSIG.

2. Pump shall also deliver not less than 150 percent of rated capacity at a pressure not less than 65 percent of rated pressure.

3. Shut off pressure shall not exceed 120 percent of rated pressure. Suction pressure is 50 PSIG.

4. Pump shall operate at a maximum synchronous speed of 3450 RPM maximum.

5. Pump shall be Peerless Model 4ABF10 or approved equal, horizontal base mounted pump.

6. Driver shall be vertical, 50 HP open dripproof, ball bearing type, AC, induction, squirrel cage motor; wound for 208 volts, 3 phase, 60 hertz. Motor shall be of such capacity that 115 percent of the full-load ampere rating shall not be exceeded at any condition of pump load for UL Listed Fire Pump Systems and 110 percent for FM Approved Fire Pump Systems. Locked rotor current shall not exceed the values specified in NFPA Pamphlet No. 20. Motor shall be at least 12 inches off floor when installed.

7. Pump and motor shall be mounted on a common baseplate constructed of steel with drip rim.

8. Pump and motor shall be checked for alignment after the pump base has been installed and grouted in place.

9. Pump Construction

   a. Casings shall be of cast iron having a minimum tensile strength of 35,000 PSI. Bearing housing supports, and suction and discharge flanges shall be integrally cast with lower half of the casing. Removal of the upper half of the casing must allow the rotating element to be removed without disconnecting the suction and discharge flanges.

   b. Impellers shall be of the enclosed type and shall be of vacuum cast bronze, dynamically balanced, keyed to the shaft, and held in place with threaded shaft sleeves.

   c. Pump shaft shall be made of SAE 1045 Steel or equal, accurately machined to give a true running rotating element. Shaft shall be protected by bronze sleeves which are key locked and threaded so that the sleeves tighten with rotation of the shaft. A gasket shall seal between the impeller hub and the shaft sleeve to protect the pump shaft.

   d. Pump shall be equipped with renewable bronze casing rings so designed that hydraulic pressure will seat them against a shoulder in the pump case around the full periphery of the wearing ring. The wearing rings will be locked by dowelling to prevent rotation. The rotating element uses heavy duty grease lubricated ball bearings and shall be equipped with water slingers. Bearing housings shall be so designed to flush lubricant through the bearing.

   e. Pump shall be provided with a lantern ring connected to the pressure side of the pump by a cored passage in the parting flange of the pump. Stuffing boxes shall be equipped with split bronze packing glands designed for easy removal for packing inspection and maintenance.

C. Accessories:

1. Provide the following accessories to conform with NFPA Standards:

   a. One (1) eccentric tapered suction reducer.

   b. One (1) concentric tapered discharge increaser.

   c. One (1) hose valve header with 6 connections.

   d. Four (4) 2-1/2 inch hose valves with caps and chains.

   e. Two (2) pressure gauges one each in suction and discharge sides of pump.

f. One (1) automatic air release valve.

g. One (1) circulation relief valve.

h. One (1) ball drip valve.

i. One (1) coupling guard.

j. One (1) casing relief valve.

D. Fire Pump Controller:

1. Provide a UL labelled and FM approved fire pump controller which shall be completely assembled, wired and tested at the factory and the assembly shall be specifically approved for fire pump control.

2. Controller shall be factory labeled "Fire Pump Controller".

3. Controller shall be located as close as practical and within sight of the motor, but protected so that it will not be injured by water escaping from the pump or piping connections.

4. Controller shall be an approved drip-tight single enclosure of the combined manual and automatic reduced voltage type starter, complete with the following:

a. Disconnect switch - externally operable, quick break type.

b. Circuit breaker - time delay type with trips in all phases set for 300 percent of the motor full load current. Interrupting capacity of circuit breaker shall be asymmetrical ampheres.

c. Running period timer - set to keep motor in operation, when started automatically, for a period of one minute for each 10 HP motor rating, but not to exceed 7 minutes.

d. Pilot lamp - to indicate circuit breaker closed and power available.

e. Ammeter test link and voltmeter test studs.

f. Alarm relay - to energize an audible or visible alarm through an independant source of power to indicate circuit breaker open on power failure.

g. Manual selection station - two position station shall be provided on the enclosure marked "AUTOMATIC" and "NON-AUTOMATIC".

h. Contacts for remote alarm of: Controller in "Pump Running" condition, loss of line power in any phase, control transformer failure or disconnection.

E. Tests:

1. Pump, motor and control panel shall be tested as one unit.

2. Pump with its driver shall be given a complete performance test with POSITIVE PRESSURE. Pumps shall be hydrostatically tested to twice the shut-off pressure, but in no case less than 250 PSIG.

3. Certified pump characteristic curves prepared from the test results shall be furnished to the Architect prior to final acceptance.

F. Jockey Pump and Control:

1. Provide an approved equal vertical multi-stage centrifugal type pump with cast iron casing, integral relief valve, bronze trim and mechanical sealed stuffing boxes.

2. Pump shall have a capacity of 8 GPM at 220 feet.

3. Pump shall be driven by 1/2 HP, 3 phase, 60 hertz, 208 volt, open dripproof motor.

4. For control of pump, provide an adjustable mercury tube pressure switch, fusible disconnect switch, a magnetic across-the-line starter, a selector switch and a minimum running period timer, all in a single NEMA 1 enclosure.

G. Alarm Panel:

1. Provide an alarm panel for mounting in Office "B". Panel shall operate on 115 volt, 60 hertz power for supervisory voltage. Panel shall be provided with contacts and visual-audible alarm signals for "pump running" condition, loss of line power in any phase and control transformer failure or disconnection.

H. Startup, operating and maintenance instructions shall be provided, refer to paragraphs 3.03 and 3.04.

I. Wiring to fire pump controller, fire pump, jockey pump controller, jockey pump, alarm panel and interconnections with fire alarm system to be provided under Division 16.

2.09 CLEANOUTS

A. Bodies of cleanout ferrules in hub and spigot or no-hub piping shall be standard pipe size conforming in thickness to that required for pipe and fittings; and shall extend not less than 3/4 inch above the hub of the pipe. The cleanout plug shall be of cast brass and shall be provided with a raised nut 3/4 inch high. Cleanouts in copper waste piping shall be soldered cast brass cleanout fittings with extra heavy brass screw plugs of the same size as the pipe line. Cleanouts in threaded waste piping shall be cast iron drainage "T" pattern 90 degree branch fittings with extra heavy brass screw plugs of the same size as the pipe.

B. Floor cleanouts in finished areas shall be equal to Josam Series #56010 with nikaloy top.

C. Floor cleanouts in unfinished areas (mechanical rooms and storage rooms) shall be equal to Josam Series 56050 with cast iron top.

D. Wall cleanouts shall be equal to Josam Series 58640 with nikaloy access frame having anchor lugs and satin finish secured cover.

2.10 PLUMBING FIXTURES

A. Manufacturer's plumbing fixture (including accessories) catalog numbers specified herein are intended only as a guide for the type and quality to be provided by this Contractor. Colors to be selected by Architect.

B.	Water Closet (P-1)	Kohler K-3420-EB Wellworth "Lite" vitreous china close-coupled siphon jet elongated toilet complete with two (2) K-4561 bolt caps, K-4652 seat and K-7638 3/8" angle supply.
C.	Water Closet (P-1A)	Kohler K-3527-EB Highline vitreious china close-coupled siphon jet elongated toilet complete with two (2) K-4561 bolt caps, K-4652 seat and K-7634 3/8" angle supply.
D.	Lavatory (P-2)	Kohler K-2195 Pennington self-rimming vitreous china oval lavatory with K-7401-DB faucet, K-7606 3/8" angle supplies with stops and K-9000 1-1/4" cast brass P-trap.
E.	Lavatory (P-2A) (Handiapped)	Kohler K-12636 Morningside vitreous china wall hung lavatory complete with K-13335 faucet, K-13711 angle supplies with stops and offset P-trap and chair carrier to suit.
F.	Bath Tub (P-3)	Kohler K-505-S Mendota enameled cast iron bath with Safeguard bottom (left or right outlet), K-7160-R pop-up drain and Symmons S-96-2X tub and shower valve assembly.
G.	Bath Tub (P-3A) (Handicapped)	Same as P-3, except modified with Symmons S-96-400-V-B24 tub and shower valve assembly.
H.	Kitchen Sink (P-4)	Just SL-2125-B-GR 4-hole, stainless steel sink with in-sink-erator Model #333 garbage disposal and Symmons S-93-2 faucet and spray.

I.	Kitchen Sink (P-4A) (Handicapped)	Same as P-4, except modified with offset P-trap, J-35 strainer for handicap (less disposal).
J.	Washer Machine (P-5) (Handicapped)	Guy Gray #BED-200 with duplex electric grounding receptacle and dryer outlet.

2.11 HOT WATER HEATERS

A. Hot water heater for Parcel 29-A shall be equal to PVI Industries 500-P-125A-TP natural gas turbo-powered water heater which shall fire 400,000 BTUH and contain 125 gallons of stored water. The unit shall recover 500 GPH at an 80°F temperature rise.

B. Hot water heater for Parcel SE-70/SE-71 shall be equal to PVI Industries 375-P-125-A-TP natural gas turbo-powered water heater which shall fire 300,000 BTUH and contain 125 gallons of stored water. The unit shall recover 375 GPH at an 80°F temperature rise.

C. Each heater shall have the following:

1. ASME temperature and pressure relief valve, temperature limiting device, drain valve, temperature and pressure gauges, low water cut-off, second main gas valve, shall be factory installed.

2. Controls shall be electronic flame monitoring systems 115V external power required upper and lower electrically operated thermostats, automatic reset temperature limiting device, electrically operated main gas valve, pressure regulator, manual gas shut-off valve, flame with shut down of pilot and main burner gas supply within 2-4 seconds if loss of pilot should occur.

3. The water heater shall include all standard equipment, shall carry a five (5) year warranty and shall meet all state and local codes.

2.12 GAUGES AND THERMOMETERS

A. Pressure Gauges:

1. Gauges shall be installed with suitable "T" handle gauge cocks to permit servicing. Unless otherwise specified herein, all guages shall be 5 inch diameter, dial type, stainless steel case with back flange, aluminum peaked ring, phospher bronze, bourdon tube, 1/4 inch forged brass N.P.T. male socket connection with wrench flats, white lithographed steel dial with black numbers and graduation. Dial graduations reading in "PSIG" shall be such that the normal operating pressure will be indicated near the middle of the scale.

2. All pressure gauges installed 8 feet or higher above the finished floor shall have 6 inch diameter dial face, unless otherwise specified herein.

B. Thermometers:

1. Thermometers shall be hermetically sealed, bimetal, dial thermometers with stainless steel cases, anti-paralox dials with raised jet black figures, stainless steel stems and brass separable sockets. Thermometers shall be vapor or mercury actuated with separable wells. Thermometers shall be graduated to "degrees F" and shall have a range so that the normal operating temperature will be in the middle of the scale.

2. The face diameter of dials on thermometers installed within 8 feet of the finished floor shall be not less than 4-1/2 inches; all other thermometers installed above 8 feet from the finished floor shall be not less than 6 inches.

C. Gauges and thermometers shall be as manufactured by U.S. Gauge or approved equal.

D. The accuracy of all gauges and thermometers shall be within one (1) percent of the scale range.

2.13 SPRINKLER AND STANDPIPE ACCESSORIES

A. Fire standpipe system accessories shall be as manufactured by Croker-Standard Division, Fire-End and Crocker Corp. W.D. Allen Manufacturing or approved equal manufacturer. The following Croker items are intended only as a guide, for the type and quality to be installed by this Contractor.

1. Class I Fire Department valves shall be equal to Underwriters' approved No. 157, 2-1/2 inch 300 pound chrome plated polished brass angle valves with red enameled iron wheel handle, No. 256, 2-1/2 inch restrictor, and No. 4051 satin brass reducer 2-1/2 by 1-1/2 inch, No. 126 chrome plated brass polished cap with chain, and two No. 2215 common spanner wrenches. Threads on each valve outlet shall conform to the local fire department standards.

2. Fire Department connections for the combined system shall be cast brass equal to No. 367 three-way 4 inch by 2-1/2 by 2-1/2 inch concealed siamese with three No. 1127 threaded plugs and chains, plate branded "STANDPIPE-SPRINKLER" and having a chrome plated polished finish. Threads shall conform to the local fire department's requirements.

B. Sprinkler Heads:

1. Sprinkler heads as manufactured by Reliable, Grinnell, or Automatic Sprinkler Corp. shall be installed in accordance with architectural reflected ceilings in all finished areas.

2. Automatic Sprinklers: Sprinklers, in general, shall be automatic - close type with a 1/2 inch nominal size orifice. Unless otherwise indicated on the drawings, temperature rating of fusible elements shall be in accordance with NFPA No. 13. Automatic sprinklers of standard temperature rating (165 degrees Fahrenheit) shall be used except in areas indicated on the drawings where above normal temperatures, will occur. In such areas high temperature sprinklers (212 degrees Fahrenheit) shall be provided.

3. In all open areas where electrical equipment is located, each sprinkler head shall be equipped with approved type shield to keep water off the electrical equipment.

4. Areas without a hung ceiling shall be brass, upright Reliable Model "G" or equal.

5. Finished areas (apartments) without hung ceilings shall be chrome plated brass sidewall type equal to Reliable Model D.

6. Areas with hung ceiling, pendent, flush, chrome plated head and escutcheon plate Reliable Model "G1" or equal.

C. Spare Sprinkler Heads and Cabinet:

1. Provide where directed by the Architect, a metal cabinet in the building containing spare sprinkler heads and wrenches.

2. Cabinet shall have shelves for storing the spare sprinkler heads in an orderly manner. The shelf spaces shall be subdivided to segregate the sprinkler heads of each type and clearly identify them with approved markings. Cabinet shall have proper arrangements for hanging the wrenches. Wrenches shall be located so as to be readily accessible.

3. Cabinet shall be dust tight and red in color, enameled finish. The outside of the cabinet door shall have painted on it in legible and clear lettering "Automatic Sprinklers - Reserve Supply", suitable standard instructions pertaining to the sprinkler systems and any other necessary information shall be fastened onto the inside of the cabinet door.

4. The cabinet size and number of each type spare sprinkler heads shall conform to the National Fire Protection Association Pamphlet No. 13.

D. Water Pressure Gauges:

1. Water pressure gauges of the double spring Bourdon type, as manufactured by U.S. Gauge, American, Mueller, Trerice, Ashcroft or approved equal, shall be installed in the sprinkler system. The gauges shall have a 6 inch diameter face with brass case and shall be Underwriters' approved.

2. Gauges shall be controlled by a valve with arrangements for drainage. An outlet, at least one quarter of an inch in size, plugged for the installation of the inspector's gauge shall be located between each valve and gauge.

3. Dial graduations reading in "psig" shall be such that the normal operating pressure of the system installed shall be indicated near the middle of the scale.

4. The accuracy of the gauges shall be within one (1) percent of the scale range.

E. Zone Alarms:

1. All sprinkler system branches on each floor supplied from the combination standpipe-sprinkler risers shall be provided by the Contractor with UL approved flow switches containing the proper contacts to be wired to the fire alarm system. Connect each flow switch to the zone module of the fire alarm system for the respective floor. Gamewell - Vane type - Model 9304 or approved equal. Wiring of each flow switch to fire alarm control panel to be provided under Division 16.

F. Control Valve Monitor Switches:

1. Provide with each OS & Y gate valve in the combination sprinkler/standpipe system a tamper proof monitor switch equivalent to Automatic S-1110-104. (N.O.) Wiring of each monitor switch to fire alarm control panel to be provided under Division 16.

G. Sundries:

1. Sundries used in connection with brass work shall be of brass with matching finish. Sundries used in connection with galvanized iron work shall be galvanized.

H. Transmitting Equipment:

1. Transmitting equipment provided under this Section of the specification for alarm valve and tamper switch alarms located in fire alarm central panel (Division 16) must be compatible in all respects with aforementioned fire alarm supervisory control system. Refer to Division 16 for requirements before purchasing transmitting equipment as herein specified for fire protection equipment.

I. Electric Alarms:

1. Electric bells shall be provided locally (sprinkler rooms) and remotely on exterior walls.

2. Contractor shall obtain Architect's approval of exterior alarm bell locations prior to installation.

3. Wiring of electric bells (interior and exterior) to be provided under Division 16.

2.14 HOT WATER CIRCULATING PUMP

A. Provide where indicated a hot water circulating pump equal to the Bell and Gossett Company "In-Line" one inch HV all bronze circulating pump with bronze impellers.

B. Control of the pump shall be by means of an immersion aquastat with visible scale and detachable well which shall be installed in the recirculating line and shall be so designed and connected that when the water temperature in the recirculating line drops to 115 degrees F, the pump shall start and when the temperature reaches 135 degrees F, the motor shall stop. The aquastat shall be guaranteed to operate within a maximum range of plus or minus 2 degrees F of the setting. The aquastat electrical contacts shall be rated 20 ampere, 120 volt.

C. Wiring of pumps and aquastats will be performed under another Division 16.

2.15 EXPANSION JOINTS, ANCHORS AND GUIDES

A. Expansion Joints:

1. Expansion joints in copper lines shall be equal to Flexonics Model HB all bronze expansion compensator, with bronze bellows, brass shrouds and end fittings, non ferrous internal parts and designed where service pressure is external to the bellows.

a. Compensators shall have internal guides extending the full length of the bellows travel, internal positive anti-torque on installation, properly located positioning clip to insure installation at correct end-to-end dimension to allow full rated traverse.

b. Compensators shall be designed for a total stroke of 2 inches (1-3/4 inch compression and 1/4 inch extension), 406 degrees F maximum operating temperature, 150 PSIG maximum test pressure.

B. Pipe Anchors:

1. Pipe anchors shall be equal to Flexonics Factory fabricated anchor pipe coupling for copper tubing.

C. Pipe Guides:

1. Pipe guides shall be equal to Flexonics Figure 1 modified pipe alignment guides with steel shell, mounting legs, steel spider with copper shims to insulate the steel spider from the copper pipe or tubing.

2. Pipe guides shall be installed on each side of the expansion joint or loop as follows:

   a. First - 4 pipe diameters from expansion joint or loop.

   b. Second - 14 pipe diameters from first pipe guide.

   c. Third, fourth or fifth if required.

      1) 20 feet on centers for one inch and 1-1/4 pipe sizes.

      2) 25 feet on centers for 1-1/2 inch and 2 inch pipe sizes.

      3) 35 feet on centers for 2-1/2 inch and larger pipe sizes.

2.16 WATER METER

A. Provide where indicated a water meters and bypass of the type and make approved by the City of Boston, Massachusetts Water and Sewer Departments.

B. Provide a pressure gauge on the discharge side of the meter and continue the cold water distribution system throughout the building as specified.

C. Provide a shut-off valve inside the foundation wall (inlet to meter) and on the discharge side of the meter.

2.17 BACKWATER VALVE

A. Valve shall be equal to Josam Series 67350-29 coated cast iron combination backwater valve, straight-through type, bronze swing-check assembly, bronze manually operated shear-gate with non-rising stem, hub connections, extension and stem to finished grade.

PART 3 - EXECUTION

3.01 IDENTIFICATION

A. All equipment and each length of pipe, each pipe fitting, trap, fixture, control panel, starter and device used in the systems shall have a permanently attached nameplate or be cast, stamped or indelibly marked with the manufacturer's mark or name, the weight, type and class. Nameplates shall be kept clean and readable at all time.

B. Piping:

1. Furnish and affix approved adhesive bands identifying the service and direction of flow of each piping system installed under this Section of the Specifications.

2. Identification shall be provided on all piping that is exposed as well as all in concealed locations such as shafts, and above removable ceilings in which piping may be viewed.

3. Each set shall consist of one band on which the name of the service is printed and one band on which is printed a black directional arrow.

4. Bands shall be applied where they can be easily read from the finished floor below, with their long dimension parallel to the axis of the pipe.

5. Bands shall be applied only after finish painting is completed.

6. In general, the piping of each system shall be identified in the following locations and the piping designation shall be taken from the legend as indicated on the drawings.

   a. Pipe mains and branches - every 25 feet in all accessible area's and 10 feet apart in congested areas.

   b. At each side of each valve and pipe tees.

   c. Each wall penetration (both sides).

   d. Each riser including branch risers from mains.

   e. At each piece of equipment.

C. Equipment:

1. Each item of equipment including controls, not provided with a manufacturer's nameplate shall be identified by this Contractor with a permanently attached nameplate.

2. Equipment marking shall be prominently located on each normally visible side of equipment. Equipment intended for instal-

lation in finished areas shall have markings located behind normally used access panels mounted so as to be readily found.

3. Nameplates, catalog numbers and rating identification shall be securely attached to electrical and mechanical equipment with screws or rivets. Adhesives or cements will not be permitted.

D. Valve Tags:

1. Valve numbers on valve tags shall correspond to numbers indicated on the Record Drawings.

E. Valve Charts and Lists:

1. Provide to the Owner through the Architect, two, printed detailed valve number lists. These printed lists shall state the numbers and location of each valve and the fixture or group of fixtures which it controls, and other necessary information, such as requiring the opening or closing of another valve or valves, when any one valve is to be opened and closed.

2. These printed lists shall be prepared in form to meet approval of the Architect and shall be framed under glass.

3.02 TESTING

A. General:

1. All labor, materials, instruments, devices and power required for testing shall be provided by this Contractor. The tests shall be performed in the presence and to the satisfaction of the Architect and such other parties as may have legal jurisdiction. No piping in any location shall be closed up, furred in, or covered before testing.

2. Where portions of piping systems are to be covered or concealed before completion of the project, those portions shall be tested separately in the manner specified herein for the respective entire system.

3. Any piping or equipment that has been left unprotected and subject to mechanical or other injury in the opinion of the Architect shall be retested in part or in whole as directed.

4. The Architect retains the right to request a recheck or resetting of any pump or instrument by this Contractor during the guarantee period at no additional cost to the Contract.

5. Repair, or if directed by the Architect, replace any defective work with new work without extra charge to the Contract. Repeat tests as directed, until the work is proved to meet the requirements specified herein.

6. Restore to its finished condition any work, provided by other Contractors, damaged or disturbed by this Contractor's tests. This Contractor shall engage the original Contractor to do the work of restoration to the damaged or disturbed work.

7. The fixtures shall be tested for stability of support and satisfactory operation. Fixture piping shall be tested when directed by the Architect for stability of support.

8. After the fixtures are set and connected, and the piping systems to same have been tested, this Contractor shall turn water on to the fixtures, equipment, fill the traps, etc., and the proper operation of all items shall be demonstrated by him in the presence of and to the satisfaction of the Architect or his designated representatives.

9. Caulking of screwed joints or holes in piping will not be acceptable.

10. This Contractor shall notify the Architect and his inspectors having jurisdiction, a minimum of 48 hours in advance of making any required tests so that arrangements may be made for their presence to witness his scheduled tests.

B. Specific:

1. Sanitary Piping Systems

   a. Before the installation of fixtures, equipment and insulation, each system including vents shall have all necessary openings plugged to permit the entire system to be filled with water to the level of the vent stack or roof drain of each system above the roof where practical. Each system shall hold this water for four hours without a drop in water level.

   b. Where a portion of the system is to be tested, the test shall be conducted in the same manner as specified herein for the entire system, except a vertical stack ten feet above the highest horizontal line to be tested may be installed, and filled with water to maintain sufficient pressure. A pump may be used to supply the required pressure. The pressure shall be maintained for a minimum of four hours or sufficient time to permit inspection for all joints.

2. Cold, Hot and Hot Water Return Piping Systems

   a. Upon completion of the roughing-in and before setting fixtures and final connections to all equipment, all water piping systems shall be tested to a hydrostatic pressure of 150 pounds per square inch gauge.

b. Each systems test shall be maintained for eight hours without a drop in pressure.

c. After testing, provide complete adjustment of all parts of each water system until design distribution or balancing is obtained throughout.

3. Combined Sprinkler/Standpipe System

a. The complete testing procedure for standpipe and each sprinkler system shall be in accordance with the requirements stated in the National Fire Protection Association Pamphlets No. 13, 14, and 20, but not less than the procedures specified herein.

b. In general, the combined standpipe-sprinkler systems shall be tested with water to a hydrostatic pressure of 225 pounds per square inch gauge. This pressure shall be maintained for a minimum of four (4) hours or until the systems have been inspected for leaks and defects.

4. Gas Systems

a. Before any system of gas piping is finally put into service, piping shall be carefully tested in the presence of, and with the approval of, the gas inspector to insure the system is gas tight.

b. To test for tightness, piping may be filled with the system designed fuel gas, compressed air or inert gas, but not with any other gas or liquid. OXYGEN SHALL NEVER BE USED FOR TESTING.

c. Piping systems, extending from the discharge side of the gas meter set assembly to the closed shut-off valve at each piece of equipment and/or appliance shall be tested to a pressure of 3 PSIG for a period of one-half hour for each 500 cubic feet of pipe volume or fraction thereof.

d. Pressure shall be measured with a mercury manometer or an equivalant approved device, so calibrated as to be read in increments of not greater than one-tenth pound. The source of pressure shall be isolated before the pressure tests are made.

5. Exterior Water Piping

a. All newly installed underground water piping shall be subjected for 2 hours to a hydrostatic pressure test of 150 pounds per square inch. Joints showing visible defects (i.e. pipe, fittings, valves,) shall be replaced by this Contractor and the test shall be repeated until the test results are satisfactory to the Architect.

b. No piping installation will be accepted unless leakage (evaluated on a pressure basis of 150 pounds per square inch) is less than 1 U.S. gallon per 24 hours per 50 feet of pipe per inch; locate and repair the defective joints until the leakage is within the specified limits. Before the replacement of permanent paving and not less than 30 nor more than 40 days after the pressure test, the Architect retains the right to request a measured leakage test of the entire new pipe line installation at no additional cost to the Contract.

3.03 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Prior to completion of the Contract, provide field operating instructions to the Owner's designated representative with respect to operation functions and maintenance procedures for the equipment and systems installed.

B. All equipment provided under this Section of the Specifications shall be placed in operation and shall function continuously in an operating test for a period of one week, without shut down due to mechanical failure or necessity of adjustment.

C. Prior to scheduling the project final inspection and after completion of the entire installation running test period, provide all work required to adjust all controls, hot water systems balancing and all maintenance to place the systems in operation to meet the requirements of this Section of the Specifications and Contract Documents.

D. During the aforementioned running test period, deliver, to the Owner through the Architect, six (6) complete sets of operating service, maintenance instruction manuals and replacement data for the equipment which will require operational maintenance or replacement and one copy of this literature shall be available during the instruction of the operating personnel while the others are checked for completeness by the Architect.

E. During the working hours of the aforementioned "one week operating test" this Contractor's instruction personnel shall be available for giving field instructions to the Owner's Operating and Maintenance Personnel. This field instruction shall cover operation, maintenance and adjustment of the equipment installed, to the complete satisfaction of the Owner.

F. Sufficient advance notice shall be given to the Owner designated operating personnel for the specified instruction period. Upon completion of instruction, obtain from such representative(s) written verification that the above mentioned instructions has been performed. Such verification shall be forwarded to the Owner through the Architect.

G. Each copy of the approved operating and maintenance manual shall contain copies of approved shop drawings, equipment literature, cuts, bulletins, performance charts, pump curves, details, equipment and engineering data sheets and typewritten instructions relative to the care and maintenance for the operation of the equipment, all properly indexed and bound in its hard-back three ring binder. Flysheets shall be placed before instructions covering each section. The instruction sheets shall be 8-1/2 inches by 11 inches with large sheets of drawings folded in neatly. Each manual shall have the following minimum contents:

1. TABLE OF CONTENTS

2. Introduction

   a. Explanation of manual and its purpose and use.

   b. Description of the plumbing-fire protection systems.

   c. Description of motor controls.

   d. Description of sequence for start-up, operating and shutdown for domestic hot water supply and circulating system; domestic cold water booster system; fire pump system; dry pipe sprinkler systems; combined standpipe-sprinkler systems; and gas booster.

   e. Safety precautions necessary for equipment.

   f. Illustrations, schematics and diagrams.

   g. Wiring diagrams.

   h. Installation drawings.

3. Maintenance

   a. Maintenance and lubricating instructions.

   b. Replacement charts.

   c. Preventive maintenance recommendations.

   d. Trouble shooting charts for equipment components.

   e. Testing instructions for each typical component.

   f. System draining and filling instructions.

   g. Two typed sets of charts indicating equipment tag number, location of equipment, specific equipment service, greasing and lubricating requirements as recommended, lubricant type and intervals of lubrication. Two complete charges of lubricating oil necessary for all equipment shall be furnished.

h. Two typed sets of instructions for ordering spare parts. Each set shall include name, price, telephone number and address of where they may be obtained.

4. Manufacturer's Literature

a. The equipment for which shop drawings have been submitted and approved.

3.04 START-UP SERVICE

A. When the equipment listed herein has been completely piped up, wired and ready for operation, the Contractor shall contact the supplier's or manufacturer's authorized representative, who as soon thereafter as possible shall visit the project and place the equipment in operation, making such adjustments as may be necessary to provide satisfactory performance.

B. Before the following equipment is accepted, the Contractor shall furnish the Architect with a written statement from supplier or manufacturer's authorized representative indicating that the equipment was started up by them and was left in satisfactory manner.

1. Packaged hot water heaters and circulating pumps.

2. Fire pump, Jockey pump and controllers.

3.05 DISINFECTION, CLEANING AND ADJUSTING

A. Disinfection:

1. Each potable water system (cold, hot and hot water return) shall be cleaned and disinfected by this Contractor. Cleaning and disinfection shall be performed after all pipes, valves, fixtures and other components of the systems are installed, tested, and ready for operation.

2. All domestic hot and cold water piping shall be thoroughly flushed with clean potable water, prior to disinfection, to remove dirt and other contaminants. Screens of faucets shall be removed before flushing and reinstalled after completion of disinfection.

3. Disinfection shall be done using sodium hypochlorite in the following manner:

a. A service cock shall be provided and located at the water service entrance. The disinfecting agent shall be injected into and through the system from this cock only.

b. The disinfecting agent shall be injected by a proportioning pump or device through the service cock slowly and continuously at an even rate. During disinfection, flow of disinfecting agent into main water supply is not permitted.

c. All sectional valves shall be opened during disinfection. All outlets shall be fully opened at least twice during injection and the residual checked with orthotolidin solution.

d. When the chlorine residual concentration, calculated on the volume of water the piping will contain, indicates not less than 50 ppm (parts per million) at all outlets, then all valves shall be closed and secured.

e. The residual chlorine shall be retained in the piping systems for a period of not less than 24 hours.

f. After the retention, the residual shall be not less than five parts per million. If less, then the process shall be repeated as described above.

g. If satisfactory, then all fixtures shall be flushed with clean potable water until residual chlorine by orthotolidin tests shall be not greater than the incoming water supply (this may be zero).

4. All work and certification of performance shall be performed by approved applicators or qualified personnel with chemical and laboratory experience. Certification of performance shall indicate:

   a. Name and location of the job and date when disinfection was performed.

   b. Material used for disinfection.

   c. Retention period of disinfectant in piping system.

   d. PPM chlorine during retention.

   e. PPM chlorine after flushing.

   f. Statement that disinfection was performed as specified.

   g. Signature and address of company/person performing disinfection.

5. Upon completion of final flushing (after retention period) this Contractor shall obtain a minimum of one water sample from each hot and cold water line and submit samples to a State-approved laboratory, Samples shall be taken from faucets located at highest floor and furthest from meter or main water supply. The laboratory report shall show the following:

a. Name and address of approved laboratory testing the samples.

b. Name and location of job and date the samples were obtained.

c. The coliform organism count. (An acceptable test shall show absence of coliform organisms.)

6. If analysis does not satisfy the above minimum requirements, the disinfection procedure shall be repeated.

7. Before acceptance of the systems, this Contractor shall submit to the Architect for his review, three (3) copies of Certification of Performance as specified above.

8. Under no circumstances shall this Contractor permit the use of any portion of domestic water systems until properly disinfected, flushed and certified.

B. Cleaning and Adjusting:

1. At the completion of the work, all parts of the installation shall be thoroughly cleaned. All equipment, pipe, valves and fittings shall be cleaned of grease, metal cuttings and sludge which may have accumulated by operation of the system for testing.

2. Any stoppage or discoloration or other damage to parts of the building, its finish, or furnishings, due to this Contractor's failure to properly clean the piping system shall be repaired by this Contractor at no increase in Contract costs.

3. At the completion of the work, all water systems shall be adjusted for quiet operation

4. All automatic control devices shall be adjusted for proper operation.

5. All plumbing fixtures and exposed metal work shall be cleaned and polished. All roof drain, deck drain, floor drain strainers and traps shall be cleaned of all debris.

6. All items of equipment shall be thoroughly inspected and any items dented, scratched or otherwise damaged in any manner shall be replaced or repaired and painted to match the original finish. All items so repaired and refinished shall be brought to the attention of the Architect for inspection and approval.

3.06 SPECIAL TOOLS

A. Provide any and all special tools recommended by the manufacturer of items furnished, noted as not being commonly available.

3.07 CERTIFICATES OF APPROVAL

A. Upon completion of the work, furnish to the Owner through the Architect in duplicate, certificates of inspection and/or approval from state and local inspection authorities having jurisdiction, indicating the installed plumbing and fire protection system's compliance to their requirements.

3.08 QUIET OPERATION

A. All work provided under this Section of the Specifications shall operate under conditions of load without sound or vibration which is abnormallly objectionable for such equipment in the opinion of the Architect. In case of moving machinery, sound or vibration noticeable outside of the room in which it is installed, or annoyingly noticeable inside its own room will be considered objectionable, shall be corrected in an approved manner by this Contractor at no change in Contract amount.

3.09 SYSTEMS

A. Sanitary Drainage Piping:

1. Although the trenching and backfilling will be performed under another Section of the Specifications, this Contractor will be responsible for the proper execution of this work and shall do all hand trimming of trench bottoms. All piping must be laid on good foundation with solid uniform bearing through the entire length. The bottom of all trenches will be trimmed by hand to receive pipe and finished bedding grade. The bottom of all trenches shall be rounded so that half of the circumference of the pipes will rest firmly on compacted gravel at proper line and grade. Bell holes shall be dug to insure pipe resting for its entire length upon the bottom of the trench.

2. This Contractor shall be responsible for checking each pipe for alignment, center line elevation and invert grade for underground installations.

3. At times when work is not in progress, open ends of pipe and fittings shall be securely closed to the satisfaction of the Architect so that no trench water, earth or other substance will enter the pipe or fitting. Any section of a building drainage system that is found defective in material, alignment, grade or joints before acceptance shall be corrected to the satisfaction of the Architect. Pipe laid through rock excavation shall rest on a 6 inch layer of well compacted gravel.

4. All sanitary (soil, waste and vent) drainage piping 3 inches and smaller in diameter shall pitch a minimum of 1/4 inch per foot, piping 4 inches and larger in diameter shall pitch a minimum of 1/8 inch per foot.

5. Soil, waste and vent stacks shall be connected as shown and extended through the roof a minimum of 18 inches. Soil, waste and vent pipes shall be concealed unless otherwise noted.

6. Branch connections to each drainage system shall be made with "Wye" and long turn "Tee Wye" fittings. Installation of short radius 1/4 bends, common offsets, double hub fitting and saddles will not be approved. Installation of short "Tee Wye" fittings will be permitted for vertical piping only, and only where space conditions will not permit the use of long turn fittings. Only fittings conforming to the Code shall be installed.

7. Changes in direction of each drainage system shall be made with "Wye" branches and 1/8 bends. Provide long sweep bends at bottom of stacks with a vertical cleanout just above the floor at places where a "Wye" and 1/8 bend and end cleanout cannot be installed.

8. Every fixture shall be separately trapped and the traps must be vented unless an approved battery vented system is being installed. Floor drains shall be considered as a fixture.

9. Vents shall be connected to the discharge of each trap in the sanitary system, thence carried individually to a point above the flood level of the fixture before connecting with any other vent pipes. Pitch the branch vents back to the fixtures.

10. Collect individual vent pipes together in branch vent lines and connect to vent stacks. Wherever possible, vent stack offsets shall be made with 45 degree fittings. The vents passing through the roof shall be a minimum size of 4 inches in diameter.

11. Cleanouts shall be provided in drainage piping at changes in directions, at foot of stacks or other required points so that all portions of the lines will be readily accessible for cleaning or rodding out.

12. Cleanouts shall be of the same size as the pipe installed in up to 4 inches in diameter and not less than 4 inches in diameter for piping larger than 4 inches in diameter.

13. The maximum horizontal distance between cleanouts; in piping 4 inches in diameter and smaller shall not be more than 50 feet apart; in piping 5 inches in diameter and larger shall not be more than 100 feet apart.

14. Traps on sanitary piping not integral with fixtures and in accessible locations shall be provided with a brass trap screw protected by the water seal, and will be regarded as a cleanout.

15. Test tees with brass cleanout plugs shall be provided at the foot of all vertical soil, waste and storm drainage stacks and at each floor. Wherever cleanouts on vertical lines occur concealed behind finished walls, they shall be extended to back of finished walls and a wall plate shall be provided.

B. Cold, Hot and Hot Water Return Piping:

1. Vacuum breakers shall be installed on supplies to each piece of equipment to prevent backsiphonage.

2. Branch lines from water service or main lines shall be taken off the top or bottom of main, using such crossover fittings as may be required by structural or installation conditions.

3. Provide shock absorbers at special equipment and tops of all risers.

4. There shall be a 1/2 inch drain valve provided for each low point in the piping, so that all parts of each water system can be drawn-off.

5. Provide suitable means of thermal expansion for the hot water and hot water return piping using swing joints, expansion loops and long-turn offsets as required to suit building conditions. Where space conditions do not permit the installation of expansion loops, mechanical expansion joints shall be provided.

6. Piping connections to equipment shall be provided with unions or flanges to permit convenient disassembly for alterations and repairs.

7. No piping shall be installed in a manner to permit back siphonage or any flow of water from sanitary or drainage systems into the water systems or their distribution piping under any conditions.

8. Air gaps, open end of funnel drains, and approved vacuum breaking devices shall be provided as specified or as indicated on the Drawings. Piping to hose-end faucets or hose-end fittings, or any fixtures where water supply outlet is below the fixture overflow rim shall have vacuum breakers.

9. Where flanges are installed in the water systems, red rubber gaskets shall be installed between each pair of flanges.

10. Heating of copper tubing to eliminate the installation of fittings will not be permitted.

11. Piping systems shall be kept clean during all phases of work. Open ends of incomplete piping shall be protected to prevent the entrance of foreign materials.

12. Pipe shall be cut accurately to measurements established at the site and shall be worked into place without springing or forcing.

13. Provide copper plated friction clamps on the cold water supplies to each urinal flushometer. Friction clamp shall be firmly clamped to the pipe and shall be firmly attached to the unfinished side of the adjacent wall structure.

14. Pipe anchors shall be provided in the hot water and hot water recirculating piping systems to permit the line to take up its expansion and contraction freely in opposite directions away from the anchored points, and shall be designed for the particular locations and loading conditions.

15. Pipe guides shall be provided in the hot water and hot water recirculating piping systems to allow the expansion and contraction of the pipe lines to move freely with the expansion joint or loop.

C. Sprinkler and Standpipe Systems:

1. Provide complete automatic sprinkler coverage for all areas indicated to be protected by sprinklers. Refer to drawings and specifications for area hazards and required densities.

2. Provide water flow and monitor switches in the standpipe and sprinkler systems.

3. This Contractor shall comply with all rules, codes, ordinances, regulations and requirements of all legally constituted authorities having jurisdiction over the whole, or any part of the work herein specified. These rules and regulations supplement this Specification and shall take precedence in any case of conflict.

4. Materials and equipment furnished in connection with the installations shall be new and furnished in accordance with the requirements of the Standards of the NFPA Bulletin Nos. 13, 14, and 20 and they shall be the best grade and quality of their respective kinds, free from natural, manufacturing or construction flaws, defects or irregularities and the finish, fitting and workmanship shall be equal to the highest commercial grade.

5. Sprinkler system shall be zoned to provide separate controls for each floor. Each zone shall include an indicating control valve and suitable provision for draining. Piping shall be arranged so that any one floor zone may be energized independently.

6. Sprinkler system shall be installed in such a manner as to harmonize with the special architectural features of the building. All information required by this Contractor con-

cerning the special architectural features may be obtained from the Contract Documents.

7. Systems shall include, but are not limited to sprinkler heads and escutcheons, control valves, check valves, electric bells and alarms, piping, fittings, hangers, drains, Inspector's test connections, flow switches, control valve monitor switches, fire department valves, fire pump test valves, flow meter, roof manifold, signs and other identification markings as required.

D. Gas System:

1. Installation of the gas piping distribution system shall be done in conformance with the rules and regulations of the Massachusetts Fuel Gas code and the local gas company.

2. Piping shall be installed with an 8 inch long sediment leg at the base of all drops and shall be arranged with drain valves at all low points. All changes in directions shall be made with plugged tee for cleaning out piping.

3. Requirements specified herein for Water System branch lines, equipment connections, valve locations and changes in direction shall apply to all interior gas piping.

3.10 GENERAL INSTALLATION REQUIREMENTS

A. Piping Installation:

1. Install piping approximately as shown on the drawings and as directed during installation by the Architect.

2. Piping shall be installed straight and direct as possible forming right angles or parallel lines with building walls and other piping and neatly spaced.

3. The horizontal runs of piping, except where concealed in partitions, shall be installed as high as possible.

4. Piping or other apparatus shall not be installed in such a manner as to interfere with the full swing of the doors and access to other equipment.

5. The arrangement, positions and connections of pipes, fixtures, drains, valves, and the like, indicated on the drawings shall be followed as closely as possible, but the right is reserved by the Architect to change locations and elevations to accommodate the work, without additional compensation for such change.

6. It shall be possible to drain the water from all sections of each cold, hot and hot water return piping system. Pitch piping back to drain valves.

7. Screwed piping of brass or chrome plated brass shall be made up with special care to avoid marring or damaging pipe and fitting exterior and interior surfaces.

8. Small fittings shall be screwed up close to the shoulders of male threads. Lampwick, cord, wool, or any other similar material shall not be used to make up thread joints.

9. Screwed pipe and copper tubing shall be reamed smooth before installation.

10. All exposed piping in connection with fixtures shall be chrome plated. Where chrome plated piping is installed, cut and thread pipe so that no unplated pipe threads are visible when the work is completed.

11. Reducing fittings, unless otherwise approved in special cases, shall be provided in making reduction in size of pipe. Bushings will not be allowed unless specifically approved.

12. Remove and replace with new materials, any copper or brass piping (chrome plated or unplated) showing visible tool marks.

13. Vertical risers shall be firmly supported by riser clamps, properly installed to relieve all weight from the fittings.

14. Any piece of pipe 6 inches or less in length shall be considered as a nipple.

15. All water service piping shall be kept a sufficient distance from other work to permit finished covering to be not less than 1-1/2 inches from other work and not less than 1-1/2 inches between the coverings (insulation) on the different services.

16. Final connection to the interior storm, garage and sanitary building drains to their respective sewer shall be made gastight by this Contractor.

17. All pipe and fittings shall be manufactured in the United States of America and in accordance with the Commercial Standards, American National Standards Institute and American Society of Testing Materials.

B. Hanger Installation:

1. All piping shall be supported from the building structure by means of approved hangers and supports, to maintain proper grading and pitching of lines, to prevent vibration and to secure piping in place, and shall be so arranged as to provide for expansion and contraction.

2. Maximum spacing of hangers on runs of pipe (vertical and horizontal) having no concentration of weight shall be as follows:

   a. Schedule - Hanger spacing in feet/pipe material.

Pipe Size (Inches)	Iron or Steel	Brass or Copper
1/2	5	5
3/4	6	6
1	7	6
1-1/4	9	7
1-1/2	9	8
2	10	8
2-1/2	11	10
3	12	10
3-1/2	13	11
4	14	12
5	16	12
6	17	12

3. Maximum spacing of hangers on soil pipe shall be five feet and hangers shall be provided at all changes in direction. Vertical Hanger rods to support piping from the structure or supplementary steel shall not exceed four feet in total length. Where pipe support assemblies exceed four feet in total length vertically, this Contractor shall provide factory fabricated channels and all associated accessories.

4. Friction clamps shall be installed at the base of the plumbing risers and at each floor (above or below floor slabs). Friction clamps installed above floor slabs shall not be supported from or rest on floor sleeves.

5. Provide hangers at a maximum distance of two feet from all changes in direction (horizontal and vertical) and on both sides of concentrated loads independent of the piping.

6. Hangers, in general, for all horizontal piping shall be Clevis type hangers. These hangers shall be sized to fit the outside diameter of the pipe insulation and insulation protectors (sheet metal shields) specified herein. For sprinkler/standpipe systems hangers shall be approved black malleable iron, heavy duty pattern having two (2) parts bolted together.

7. All vertical drops and runouts (including insulated pipes) shall be supported by split ring hangers with extension rods and wall plates. These hangers shall be copper plated when used on uncovered copper tubing. Supports on insulated vertical piping shall be sized to fit the outside diameter of the pipe insulation with 360 degree insulation protector.

8. Provide on all horizontal insulated lines, pipe covering protectors (shields) at each hanger. Each protector shall be sized to fit the outside diameter of the Pipe insulation.

9. Retaining straps shall be provided with all beam clamps.

10. All supplementary steel including factory fabricated channels and associated aaccessories, including 12 inch long sheetmetal shields, throughout the project for this Section of the Specifications both suspended and floor mounted shall be provided by this Contractor and shall be subject to the approval of the Architect.

11. Hangers shall not pierce the insulation on any insulated pipe except when prior approval is given.

12. Wire, tape or wood fastenings for shims or support of any pipe or tubing shall not be used.

13. Remove all rust from the ferrous hanger equipment (hangers, rods, and bolts) and apply one coat of red lead immediately after erection.

14. Piping at all equipment and each control valve shall be supported to prevent strains or distortions in the connected equipment and control valves. Piping at equipment shall be supported to allow for removal of equipment, valves and accessories with a minimum of dismantling and without requiring additional support after these items are removed.

15. All piping shall be independantly supported from the building structure and not from the piping, ductwork, conduit or ceiling suspension systems of other systems.

16. Installation of hangers which permit wide lateral motion of any pipe will not be acceptable.

17. "C" clamps installed with pipe hangers or equipment hangers will not be permitted unless provided with retaining straps.

18. Underground installations - hangers and rods shall be wired brushed prior to installation and given two (2) heavy coats of asphaltum. Hanger rods shall be secured to reinforcement steel by welding.

C. Pipe Covering Installation:

1. Before pipe covering is applied, all pressure tests shall have been performed and approved. Also, before pipe covering is applied to all domestic and fire protection water piping, all horizontal storm and sanitary piping inlcuding vents in the parking levels, all electrical heat tracing shall have been provided, tested and approved. Electric heat tracing will be provided under Division 16.

2. Pipe covering shall be applied over clean, dry surfaces.

3. Pipe covering shall be continuous and shall be carefully fitted with side and end joints butted firmly and tightly together and finished as specified herein.

4. Pipe covering and auxiliaries shall be kept dry during storage and application.

5. Adhesives, cements and coatings shall not be applied when the ambient temperature is below 40 degrees Fahrenheit.

6. Valve bodies shall have covering applied up to the stem.

7. It is the intent of this Specification that all vapor barriers be sealed and be continuous throughout. Staples shall not be used on vapor barrier jackets.

8. Where pipe covering ends at equipment or fixtures, end caps on the covering shall be provided.

9. Adequate operating clearances shall be provided at control mechanisms.

10. Pipe covering shall be provided on all piping passing through ceilings and through the interior above ground sleeves (wall and floor).

11. Pipe covering for flanges shall overlap the adjoining pipe by a minimum of 3 inches on each side.

12. All voids and or seams in insulation shall be filled with mineral cement or insulating cement and finished as specified herein.

13. In the event staples are used, they shall be coated with a vapor barrier mastic after installation and taped. These staples shall not be visible on finished installation.

14. End joints of each section of the installed pipe covering shall be tightly butted.

D. Installation of Sleeves, Inserts and Escutcheons:

1. Sleeves in floors shall be set one (1) inch above the finished floor surface or as indicated on the Architectural Drawings.

2. Sleeves through interior masonry or non-masonry walls or partitions shall be set flush with the finished surfaces of the wall or partition.

3. Field drilling for inserts required for work under this Section of the Specifications shall be provided by this Contractor.

4. Each interior wall or partition sleeve shall be packed with foam or glass wool to within one inch of each face of wall and the remaining portion of each end of sleeve shall be sealed with mineral fiber rope.

5. Escutcheon shall be installed around all exposed insulated or bare pipe, except water closet starts or bends passing through a finished floor, wall or ceiling. Escutcheons shall fit snugly around the bare pipe or insulated pipe.

E. Valve Installation:

1. Location of Valves: There shall be valves where indicated on the drawings and where specified as follows:

   a. At building service entrances, foot of all supply risers, branches to separate fixtures, equipment, hose bibbs, connections to other systems and sectionalizing points in each system.

   b. Each fixture supply shall have a separate angle stop or straight stop finished like the pipe it services.

   c. Each piece of equipment shall have isolation valves for each service connected.

   d. At the front of each riser, on the inlet and outlet side of backflow preventors and special control valves.

   e. At the low points of each water system including trapped sections, provide a tee with 1/2 inch branch and valve with 3/4 inch hose end adapter and attached chain with cap.

   f. Valves shall be located to permit easy operation, replacement or repairs.

   g. Shut-off valves in the Standpipe and Sprinklers system shall be installed at the base of each combined riser, in each sprinkler control station on each floor, where indicated on the Contract Drawings, required by NFPA pamphlets 13, 14, 20, and the Owners insuring agency.

2. Provide balancing valves in hot water recirculating piping system to permit an even temperature throughout.

F. Installation of Gauges and Thermometers:

1. Thermometers and pressure gauges shall be installed in such a manner as to cause a minimum restriction to the flow in the pipes and so that they can be easily read from the floor.

2. Thermometers shall be installed in the outlet piping from the hot water heater and the hot water circulating pump.

3. Pressure gauges in the sprinkler and standpipe systems shall be installed where required by the appropriate Underwriter.

G. Installation of Plumbing Fixtures:

1. General

   a. Refer to Architectural Drawings for locations and mounting heights of all plumbing fixtures, electric water coolers and showers.

   b. Provide with all plumbing fixtures, all trim, supports, fittings, connections and all incidentals necessary to make a complete installation in accordance with plumbing codes, and the Contract Documents.

   c. All visible hanger nuts and all escutcheons shall be chrome plated over nickel plate.

2. Fixture Supports

   a. All fixtures (including electric water coolers) shall be supported and fastened to the building structure. The method of support for each type fixture shall be as specified herein, except when the fixture designations on the Contract drawings indicate modifications.

   b. Lavatories, unless otherwise specified herein, shall be generally supported on counter tops with chrome plated trim.

   c. Urinals shall be supported by floor mounted carrier with support plate, bearing plate, adjustable extension, tubular uprights, block bases and chrome plated trim.

   d. Installations shall be complete with all necessary bolts, nuts and washers, iron or brass connecting nipples between fixtures and piping system of the proper length and graphited asbestos gaskets for closet connections.

   e. Where all wall hung fixtures are secured to masonry walls or partitions they shall be fastened with 1/4 inch through bolts provided with nuts and washers at back. Bolt heads and nuts shall be hexagon and exposed bolts, nuts, washers and screws shall be chromium plated brass.

   f. Where secured to concrete or brick walls, they shall be fastened with brass bolts or machine screws in lead sleeve type expansion shields and shall extend at least 3 inches into solid concrete or brick work, except fixtures specified to be supported by chair carriers.

3. Fixture Trim

   a. All materials specified to be chromium plated shall be thoroughly cleaned and polished before plating and plate shall be heavily, thoroughly and evenly applied, guaranteed not to strip or peel.

   b. Where escutcheons are not furnished with plumbing fixtures, this Contractor shall supply them. Escutcheons shall be the type and material specified herein.

   c. Each fixture shall be separately trapped using the type and size of trap specified herein and required by the Plumbing Code.

   d. Unless otherwise specified, faucets and all exposed fittings shall be chromium plated. Chromium plating for brass shall be applied on a first plating of nickel.

   e. All fixtures requiring hot and cold water shall have the cold water faucet on the right hand side of the fixture and the hot water faucet on the left hand side of the fixture.

   f. All brass shall conform to brass tubing and shall be not less than No. 17 gauge.

H. Sewer Installation:

1. Sewer installation shall be accurate, with the pipe installed straight and true to grades established on the Drawings. Connections to structures (i.e. manholes, gas-sand interceptor) and building drain shall be made watertight.

3.11 FIXTURE PROTECTION AND CLEANING

A. Water closets, lavatories, electric water coolers, and urinals shall be boarded over and all other fixtures protected with pasted on paper. Post notice prohibiting the use of all fixtures prior to acceptance.

B. All plated or polished fittings, pipes and appliances shall be coated with vaseline immediately after installation and shall be finally highly polished and free from all marks and foreign substances when directed by the Architect.

C. Thoroughly clean all fixtures prior to final acceptance.

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PART 1 - GENERAL

1.01 GENERAL

A. Review all drawings and all sections of the Specification for provisions therein affecting the work of this section. The scope of work shall include, but shall not be limited to, the following:

1. Furnishing and installing gas fired hot water boilers, including gas trains and gas flues.
2. Furnishing and installing hot water piping system with piping accessories, circulating pumps, and perimeter fin tube radiation with enclosures.
3. Furnishing and installing of mechanical ventilation for toilets, kitchens, laundry areas, mechanical rooms and various spaces as indicated on the drawings.
4. Furnishing and installing thermal and acoustic insulation.
5. Furnishing and installing chemical water treatment for the hot water system.
6. Providing vibration control as indicated on the drawings and as specified herein.
7. Furnishing and installing a complete system of automatic temperature control as indicated on the drawings and as specified herein.
8. Testing, adjusting and balancing of the hot water heating system.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. The specifications for the overall construction delineate various items of work under each trade. The list below sets forth the work not included in this section of the specifications.

B. In the absence of more detailed information, this list shall be taken as a specified instruction to the HVAC trade to exclude the work not assigned to it.

C. The following items of labor and materials incidental and/or related to the installation of HVAC work will be provided and/or installed under other sections of these specifications at no cost to this Contractor.

1. List

   a. Temporary heat, light, power and water.

   b. Access panels installation.

   c. Excavation and backfilling inside and outside of building.

   d. Keeping site and excavation free of surface water during construction.

   e. Flashing and counter flashing.

   f. Cutting and patching.

   g. Equipment concrete foundations, housekeeping pads and machine bases.

   h. Finish painting of all exposed work.

   i. Exterior wall louvers.

   j. Setting and caulking of louvers.

   k. Undercut and louvered doors.

2. The Plumbing Contractor will provide the following:

   a. Make-up water valved connections for the hot water heating system.

   b. Piping to the boiler gas trains and vents from the gas trains.

3. The Electrical Contractor will provide the following:

   a. All motor starters, except as noted in HVAC specifications and drawings, and wiring between starter and motor.

   b. All power wiring for mechanical equipment motors.

   c. All motor to motor (starter to starter) interlock wiring.

D. For items which are to be installed but not furnished as part of the HVAC work, the HVAC work shall include:

1. The coordination of their delivery.

2. Their unloading from delivery trucks driven in to any point on the property line at grade level.

3. Their safe handling and field storage up to the time of permanent placement in the project.

4. The correction of any damage, defacement or corrosion to which they may have been subjected.

5. Their field make-up and internal wiring as may be necessary for their proper operation.

6. Their mounting in place including the purchase and installation of all dunnage, supporting members, and fastenings necessary to adapt them to architectural and structural conditions.

7. Their connections to building systems including the purchase and installation of all termination fittings necessary to adapt and connect them to the building systems.

E. Items which are to be installed but not furnished as part of the HVAC work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the HVAC work will be considered only if presented in writing within one week of the date of delivery to the project of the items in question. The HVAC work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

1.03 CODES, PERMITS AND FEES

A. Unless otherwise specified or indicated, materials and workmanship and equipment performance shall conform with the latest edition of the following standards, codes, specifications, requirements and regulations.

1. All applicable ASHRAE Standards.

2. Hydraulic Institute's requirements.

3. American Boiler Manufacturer's Association.

4. Mechanical Contractor's Association recommendations.

5. American National Standards Institute requirements.

6. National Electrical Manufacturer's Association.

7. Sheet Metal and Air Conditioning Contractor's National Association.

8. American Society for Testing Materials requirements.

9. Massachusetts State Uniform Fire Prevention and Building Code.

10. Occupational Safety and Health Administration regulations.

11. National Fire Protection Association requirements.

12. Air Moving and Conditioning Association requirements.

13. Massachusetts State Energy Conservation Code.

B. All other state and local codes and/or authorities having jurisdiction including any and all other standards specifically indicated in other paragraphs of this specification.

C. The HVAC Contractor shall give all notices, file all plans, obtain all fees and obtain all necessary approvals from authorities having jurisdiction, deliver all certificates of inspection and test approvals to the Owner.

1.04 WARRANTIES

A. The HVAC Contractor shall submit manufacturer's warranties for products as specified in this Section. All warranties shall be submitted prior to final payment.

B. All materials, items of equipment and workmanship furnished under this section shall carry standard warranty against all defects in material and workmanship for a period of not less than one (1) year from date of final acceptance of the work. Any fault due to defective or improper material, equipment, workmanship or manufacturing design which may develop within that period shall be made good, forthwith, by and at the expense of this Contractor, including all other damage done to areas, materials and other systems resulting from the failure.

C. This Contractor shall guarantee that all elements of the systems meet the specified performance requirements set forth herein or as indicated in the drawings.

D. Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by this Contractor at no additional cost to the Owner.

1.05 INSPECTION OF SITE CONDITIONS

A. Before starting work, the Contractor shall visit the site and examine the conditions under which the work has to be performed. He shall report in writing any conditions which might adversely affect the Contractor's work and shall not proceed with the work until defects have been corrected and conditions are satisfactory.

1.06 SUPERVISION

A. This Contractor shall supply the service of an experienced and competent supervisor who shall be in charge of the Contractor's work at the site.

1.07 EQUIPMENT AND MATERIALS

A. All materials, equipment and accessories provided under this section shall be new and unused products of recognized manufacturers as approved by the Owner

B. Provide materials in conformance with herein above listed agency's applicable codes and regulations. Should requirements of the specifications conflict with any code or regulation, the more stringent requirement shall apply.

1.08 ELECTRIC MOTORS

A. Motors shall be built in accordance with latest standards of NEMA and as specified. Motor shall be specifically and expressly wound for voltage required.

B. Motors shall be tested in accordance with standards of ANSI C50 and conform therewith for insulation resistance and dielectric strength.

C. Motors shall be provided with conduit terminal boxes of size adequate to accommodate conduits and wires as sized on electrical drawings or specified under this Section.

D. Capacity shall be sufficient to operate associated driven devices under conditions of operation and load and with overload and at least horsepower indicated or specified. All motors shall be of the high efficiency, low energy consuming type most suitable for the application and its specific environmental location in this building. All motor replacements necessary for compliance to the application shall be at no additional cost to the Owner.

E. All motors shall be suitable for continuous duty at rated horsepower with temperature rise not to exceed 40 degrees C for drip-proof motors, 50 degrees C for splash-proof motors, 55 degrees C for totally enclosed or explosion-proof motors. All motors shall be capable of 25 percent overload without overheating and suitable for operation for the ambient conditions of its specific location in the building.

F. Direct connected motor shall be furnished with adjustable base. Motors connected to driven equipment by belt or shaft shall be furnished with adjustable sliding bases, except fractional HP motors, which shall have slotted mounting holes.

G. Motors shall have nameplates giving manufacturer's name, serial number, horsepower, speed and current characteristics.

H. Motors smaller than 1/2 horsepower shall be capacitor-starter or split-phase type designed for 120 volts, single phase, 60 cycle operation unless otherwise specified. This shall be coordinated with the electrical contractor.

I. Motors 1/2 horsepower and larger shall be squirrel cage induction type designed for 208 volts, three-phase, 60 cycle operation unless otherwise specified.

J. Motor control centers will be furnished and installed by the Electrical Contractor.

1.09 STORAGE AND PROTECTION

A. The HVAC Contractor shall arrange for and provide a storage space or area at the job site for all HVAC equipment and materials to be installed in the project. The exact location of portable storage vans at the job site or protected storage areas within the building construction, conditions permitting, shall be arranged with the Owner.

B. Storage space shall be provided by the HVAC Contractor for the storage of all equipment and materials received and/or that are to be received for installation in this project.

C. All HVAC equipment and materials, upon receipt at the job site, shall be thoroughly inspected by the HVAC Contractor.

D. After inspection, all HVAC equipment and materials shall be moved to the storage van or area provided. All equipment and materials shall be placed in the storage areas so as to prevent damage to same.

E. During the construction period, the HVAC Contractor shall adequately protect against damage to all equipment and materials installed during the progress of the construction.

F. The HVAC Contractor shall, before completing his work and before final inspection, replace all damaged or defective equipment and material as required.

1.10 SURVEYS AND MEASUREMENTS

A. This Contractor shall base his measurements, both horizontal and vertical, from established referenced points and shall be responsible for correct laying out of his work.

B. In the event of discrepancy between actual measurements and those indicated, this Contractor shall notify the proper authority in writing and shall not proceed with his work until written instructions have been issued.

1.11 COORDINATION

A. Work shall be performed in cooperation with other trades on the project and so scheduled as to allow speedy and efficient completion of the project.

B. This Contractor shall furnish to the other trades advance information on locations and sizes of all frames, boxes, sleeves, and openings needed for his own work, and also furnish information and shop drawings necessary to permit trades affected by this Contractor's work to install their work properly and without delay.

C. Where there is evidence that work of this Contractor will interfere with the work of other trades, this Contractor shall assist in working out space conditions to make satisfactory adjustments.

D. This Contractor shall, make reasonable modifications in his work as required by normal structural interferences, pay all expenses for additional openings or relocating or enlarging existing openings thru concrete floors, walls, beams and roof provided for HVAC work.

E. If this Contractor installs his work before coordinating with other trades so as to cause interference with the work of such trades, he shall make all necessary changes in his work to correct the condition without extra cost.

F. This Contractor shall protect all materials and work of other trades from damage that may be caused by his work and shall be responsible for repairing any damages caused by him without any extra cost to the Owner.

1.12 CUTTING AND PATCHING

A. Sleeves, inserts, anchor bolts and similar items set into concrete or masonry or the work of other trades shall be furnished and installed by this Contractor. This Contractor shall be responsible for all such items necessary to hang or support his equipment.

B. When, in order to accommodate this Contractor's work finished materials of other trades must be cut or fitted in the shop, this Contractor shall furnish the necessary drawings for transmittal to the trades whose materials must be cut or fitted.

C. This Contractor shall do all drilling and cutting of small holes in concrete walls and floors as required for sleeves and supports with the approval of the Owner.

D. This Contractor shall provide all information for cutting and patching of the work under his trade. Any cutting and patching of work of other trades to accommodate the work of this Contractor, shall be paid by this Contractor.

1.13 ACCESSIBILITY

A. All work shall be installed so that parts requiring periodic inspection, operation, maintenance and repair are readily accessible. Minor deviations from the drawings may be made to accomplish this, but changes of substantial magnitude shall not be made prior to written approval.

1.14 ACCESS PANELS

A. Access panels for walls, ceilings and floors will be furnished and installed under finish trade section. HVAC trade shall be responsible for coordinating size and location of all access panels.

B. Access panels shall be located at all duct access doors and as indicated on drawings or as required to permit access for service and maintenance or replacement of all concealed HVAC equipment and devices.

C. All access panels shall be installed, in a workmanlike manner, in closets, storage rooms and/or other non-public areas, positioned so that the equipment can be easily reached, and the size shall be sufficient for this purpose (min. 16" x 16"). When access panels are required in corridors, lobby or other habitable areas, they will be located as directed by the Owner.

D. Access panels shall be prime painted and provided with cylinder lock and two keys as manufactured by Milcor. Type shall be as follows:

1.	Dry Wall Surfaces	Milcor Type DW
2.	Masonry Construction	Milcor Type M

E. Access panels shop drawings shall be submitted for approval.

1.15 FIREPROOFING

A. All clips, hangers, clamps, supports and other attachments to the fire rated structure shall be coordinated with other trades in order to avoid any damage to the fireproofing.

B. All conduit and other items which would interfere with the proper application of fireproofing shall be installed after the application of fireproofing work.

1.16 TEMPORARY HEAT

A. The HVAC Contractor shall coordinate his work with the progress of the construction so that the permanent heating system will be ready to provide temporary heat as soon as the building is closed in.

B. The HVAC Contractor shall be in charge of and provide all labor required for the attendance and operation of the permanent heating system that is used for temporary heating purposes. Continuous direct attendance shall be provided whenever the permanent system is in operation.

1.17 REMOVAL OF RUBBISH

A. The HVAC Contractor shall keep the building and site clean from his own rubbish and/or waste materials and, upon completion of his contract, shall leave the building, site and installation in a clean acceptable condition.

1.18 SAFETY PRECAUTIONS

A. The HVAC Contractor shall comply with all of the safety requirements of OSHA throughout the entire construction period of the project.

B. The HVAC Contractor shall furnish, place and maintain proper guards for prevention of accidents and any other necessary construction required to secure safety of life and/or property.

1.19 PORTABLE OR DETACHABLE PARTS

A. The HVAC Contractor shall retain in his possession and shall be responsible for all portable and/or detachable parts and portions of the installation and all other devices or materials that are relative to and necessary for the proper operation and maintenance of the HVAC system until final completion of his work.

B. The HVAC Contractor shall replace all stolen, lost or damaged items relative to the installation and operation of the HVAC system at his own expense before the building is accepted by the Owner.

1.20 SELECTION AND ORDERING OF MATERIALS

A. The HVAC Contractor shall arrange for purchase and delivery of materials and equipment required in ample quantities and at the proper time. Substitution on account of inability to obtain delivery will not otherwise be allowed as the work proceeds.

1.21 SLEEVES, INSERTS AND PLATES

A. This Contractor shall coordinate with other trades the location of and maintaining in proper position, sleeves, inserts and anchor bolts supplied and/or set in place by him. In the event of incorrectly located preset sleeves, inserts, anchor bolts, etc. requiring cutting and patching of finished work, it shall be done under this Contractor's costs.

B. Unless otherwise specified herein, all pipes and ductwork passing through floors, walls or partitions shall be provided with sleeves.

C. All openings around the sleeves shall be packed with rigid sound and fireproof material in order to avoid noise transmission from one space to another. The clearance space inside the sleeves shall be packed with fiberglass material.

1.22 QUIET OPERATION

A. HVAC equipment shall operate without sound or vibration which is abnormally objectionable for such equipment. Sound or vibration noticeable outside of the room in which it is installed, or annoyingly noticeable inside its own room will be considered objectionable. Objectionable sound or vibration shall be corrected in approved manner by this Contractor at no cost to the Owner.

1.23 TOOLS, EQUIPMENT, STAGING AND HOISTING

A. All necessary tools and equipment such as conduit bending machines, staging for erection of HVAC equipment shall be furnished at the job site by the HVAC Contractor for fabrication and erecting all related equipment covered by this section of the specifications.

1.24 BASES AND FOUNDATIONS

A. All concrete bases, supports and grouting will be furnished and installed under Section, CONCRETE.

B. The HVAC Contractor shall furnish to the appropriate trade all required foundation sizes, bolts, washers, sleeves, plates and templates for HVAC equipment.

C. The size of the foundation bolts shall be as recommended by the manufacturer.

D. All equipment shall be set on the foundation and shimmed level with steel shims for uniform bearing by this Contractor.

1.25 EXCAVATION AND BACKFILLING

A. All excavation and backfilling required for equipment and piping installed under this section will be performed as specified.

B. This Contractor shall furnish to the appropriate trade all required information as to the locations, sizes, grades and elevations of all conduit, equipment and foundations requiring excavation and shall be responsible for same.

C. The minimum width of trenches for pipes shall be such as to give a clearance of at least eight inches on each side and bottom of fittings.

D. All irregularities in the trench bottom or where the excavation has exceeded the depth required shall be filled with sand properly compacted to the required depth.

E. Backfill shall be free of rocks, debris, cinders or other corrosive material.

1.26 DAMAGE TO OTHER WORK

A. The HVAC Contractor shall be held responsible for and shall pay for all damages to other work caused by his work or workmen.

B. Repairing of such damages will be done by the Contractors who installed the work.

1.27 SUPPLEMENTARY STEEL, CHANNELS AND SUPPORTS

A. Furnish and install all supplementary steel, channels and supports required for the proper installation, mounting and support of all equipment.

B. Supplementary steel and channels shall be firmly connected to building construction in a approved manner as shown on the drawings or hereinafter specified.

C. The type and size of the supporting channels and supplementary steel shall be determined by the HVAC Contractor and shall be of sufficient strength and size to allow only a minimum deflection in conformance with the manufacturer's requirements for loading.

D. All supplementary steel and channels shall be installed in a neat and workmanlike manner parallel to the walls, floor and ceiling construction. All turns shall be made with 90 degree and 45 degree fittings, as required to suit the construction and installation conditions.

E. All supplementary steel, channels, supports and fittings shall be Underwriters' Laboratories, Inc. approved, be galvanized steel and be manufactured by Unistrut or approved equal.

F. All pipe and fittings on all work are to be secured as specified hereinafter.

1.28 CROSS AND INTERCONNECTIONS

A. No HVAC fixtures, equipment, device or piping shall be installed which will provide a cross or interconnection between a distributing supply for drinking or domestic purposes and non-potable supply or a drainage system or a soil or waste pipe which will permit or make possible the back-flow of sewage, polluted water or waste into the domestic water supply system.

1.29 JURISDICTIONAL DISPUTES

A. It shall be the responsibility of this Contractor to pay all costs for subletting any work that may be required to perform any of the work shown on the other trade's Contract Drawings or specified herein in order to avoid work stoppages due to jurisdictional disputes. The basis for subletting work in question, if any, shall conform with precedent agreements.

1.30 TYPICAL DETAILS

A. Typical details where shown on the drawings shall apply to each and every item of the project where such items are applicable. They are not repeated in full on the drawings, which in many cases are diagrammatic only, but with the intention that such details shall be incorporated in full. Any alternate method used by the Contractor shall have prior approval before installation.

1.31 SHOP DRAWINGS

A. Shop drawings shall be submitted in accordance with requirements specified.

B. Documents will not be accepted for approval unless:

1. They comply as to number of copies and type of paper with the requirements of this specification.

2. They include complete information pertaining to appurtenances and accessories.

3. They are properly marked with service or function identification as related to the project, where they consist of catalog sheets displaying other items which are not applicable.

C. Submit shop drawings for all equipment and material specified in Part 2 and as indicated on the drawings.

D. Substitutions

1. Where the HVAC Contractor proposes to use an item of material or equipment other than that shown or specified in the Contract Documents, this Contractor shall assume the cost of and entire responsibility for any change in his work from the work as shown or specified occasioned by approval of such item. In addition, this Contractor shall make all such arrangements and assume all costs occasioned by changes in the work of other trades that he may require in order to install the approved substitution; such changes shall not be a matter for subsequent Change Order increasing the Contract Sum.

1.32 DEFINITIONS

A. As used in this section, the following terms are understood to have the following meaning:

1. Contractor unless otherwise qualified, shall mean the installer of the work under this section.

2. Furnish shall mean purchase and deliver to the project site, complete with every necessary appurtenance and support.

3. Install shall mean unload at the delivery point at the site and perform all work necessary to establish secure mounting and proper operation at the proper location in the project.

4. Provide shall mean "Furnish" and "Install".

5. Work means all labor, materials, equipment, apparatus, controls, accessories and all other items required for a proper and complete installation.

6. Piping includes in addition to pipe or tubing, all fittings, flanges, unions, valves, strainers, drains, hangers and other accessories relative to such piping.

7. Concealed means hidden from sight in chases, furred spaces, shafts, hung ceiling, embedded in construction or in crawl space.

8. Exposed means not installed underground or concealed as defined above.

9. Any work by others means not by HVAC Contractor, but work furnished and/or installed by other Contractors, (performing their respective work) within this Contract.

10. Coordinate means all HVAC work compliance to other trades.

11. Cold Water Piping means make-up water piping.

1.33 TECHNICAL ABBREVIATIONS

A. TDH - Total Dynamic Head.
B. PSI - Pounds Per Square Inch.
C. RPM - Revolutions Per Minute.
D. HP - Horsepower.
E. GPM - Gallons Per Minute.
F. PSIG - Pounds Per Square Inch Gauge.
G. °F - Degrees Fahrenheit; °C - Degrees Centrigrade.
H. CFM - Cubic Feet Per Minute.
I. MBH - 1000 BTU Per Hour.
J. RH - Relative Humidity.
K. FPM - Feet Per Minute.
L. Tons - Tons of Refrigeration - 12000 BTU/HR.
M. KW - Kilowatt.
N. db - Decibels.
O. NC Level - Noise Criteria Level.
P. SP - Static Pressure.
Q. TP - Total Pressure.
R. OV - Outlet Velocity.

1.34 DRAWINGS AND SPECIFICATIONS

A. It is the intention of Contract Documents to call for complete, finished work, fully tested and ready for continuous operation.

PART 2 - PRODUCTS

2.01 PIPING, FITTINGS AND ACCESSORIES

A. General:

1. Unless otherwise specified, all piping 2 inch diameter and smaller shall be copper Type "L" hard drawn. Unless otherwise specified all piping over 2-1/2 inch diameter shall be ASTM A120/ASJCW using welding fittings.

2. All connections to apparatus 2 inch diameter and smaller shall be made with 150 pound brass seat unions. All connections to apparatus 2-1/2 inch diameter and larger shall be made with welding neck 150 pound flanges to match flange on valves or apparatus to which attached.

3. All welding fittings shall be ANSI B6.9 and ASTM A-234 North American made steel welding fittings of the same weight and material as the piping to which attached. Tee welds reducing one size or less shall be made with welding tees of the same manufacturer as the welding fittings, or "weldolets" as manufactured by Bonney Forge, Taylor, Tubeturn. Tee welds on branches reducing more than one size shall be made with shaped nipples beveled at both ends and with welding tees when branches are same size as main. All welding shot shall be removed. Unless otherwise indicated, all welding elbows at changes in direction of piping shall be long radius elbows. Use eccentric welding reducing fittings at changes in pipe size for horizontal piping.

4. Welded pipe bevels shall be Mill-beveled or machine-beveled on both ends before being welded. Bevels shall be 35 or 40 degrees. On odd lengths of steel pipe, beveling may be accomplished by means of cutting torch, provided scale and oxide are removed with hammer and chisel and entire surface filed or ground to smooth finish.

5. All fittings for piping 2 inch diameter and smaller shall be wrought copper solder joint, ANSI B16.22, Type L.

6. All piping 2 inch diameter and smaller shall be soldered using 95-5 solder and non-corrosive flux.

7. In all piping systems where pipes of dissimilar metals are jointed, dielectric (insulating) unions suitable for the intended service shall be provided.

B. Welding:

1. Welding shall conform to current standards and recommendations of the American Welding Society of Building Trades.

2. Before assigning any welders to work covered by this specification, this Contractor shall provide the names of pipe welders to be employed for the work, together with each welder's assigned number, letter or symbol which shall be used to identify the work of that welder and which shall be affixed immediately upon completion of each weld. This Contractor shall also submit with the list of names, copies of each welder's certified qualification tests prescribed by the National Certified Welding Bureau or by other reputable testing laboratory using procedures covered in the latest editions of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section IX, "Qualification Standard for Welding and Brazing Operators." Welders must be certified for all positions. Certification shall be by approved agencies other than the Contractor performing the work.

3. If requested by the Owner, this Contractor shall submit identifying stenciled tests coupons made by any operator in question. This Contractor shall require any welder to retake the tests when, in the opinion of the Owner, the work of the welder creates a reasonable doubt as to his proficiency. Tests, when required, shall be conducted at no additional expense to the Owner and the welder in question shall not be permitted to work as a welder on this project until he has been recertified. Recertification of the welder shall be made only after the welder has taken and passed the required tests; welder must pass the tests without benefit of retests in order to resume work as a welder on this project.

4. Welding shall conform to the American National Standards Institute for Power Piping ANSI B31.1 - (1977). Welds shall have penetration complete to the inside diameter of the pipe and the recommended spacing and bevels between ends of pipes prior to welding shall be used in all cases to assure full penetration.

C. Hot Water Piping:

1. All hot water supply and return piping 2 inch diameter and smaller shall be Type L hard drawn copper tubing with wrought copper solder joint type or cast brass sweat fittings conforming to ASTM Specification B-88, ANSI Standards B16.22, B16.18, and B16.18a, respectively. Flange fittings shall be Class 150 cast bronze conforming to ANSI Standards B16.24.

2. Fittings for copper tubing shall be Chase Sweat Fittings, Mueller Brass Company's "Streamline" solder fittings, or "Arco" wrought copper fittings. All piping shall be installed in a workmanlike manner, according to the manufacturer's instruction. All joints shall be thoroughly cleaned before connecting. All solder for copper tubing shall have a melting point of not less than 460 degrees F, composed of 95% tin and 5% antimony.

D. Cold Water Make-Up Piping:

1. Furnish and install cold water make-up piping as indicated on the drawings, and as specified herein. Cold water piping shall be furnished and installed from valved outlets furnished and installed by the Plumbing contractor. Cold water piping shall be Type L hard drawn copper tubing with solder joint fittings, using 95-5 tin-antimony solder and non-corrosive flux.

2.02 VALVES AND COCKS

A. Furnish and install all valves and cocks where indicated on the drawings for the operation and maintenance of the heating, ventilating and air conditioning systems. All valves in each class 2-1/2 inch diameter and larger shall be supplied by the same manufacturer. All valves in each class 2 inch diameter and smaller shall be supplied by the same manufacturer. Any deviations from specifications shall be clearly identified in shop drawings.

1. Gate valves 2 inch diameter and smaller shall be ANSI Class 150 with bronze body, solid wedge, inside screw, non-rising spindle, screwed end valves, as manufactured by Jenkins, Walworth or approved equal.

2. Unless otherwise specified or noted on the drawings, gate valves 2-1/2 inch diameter and larger shall be ANSI Class 150 with iron body, bronze mounted, solid wedge, flanged valves, inside screw, non-rising spindle. OS & Y valves shall be ANSI Class 150 and shall be as manufactured by Jenkins, Walworth or approved equal.

3. Globe valves 2 inch diameter and smaller shall be ANSI Class 150 with bronze body, renewable composition disc type valves with discs suitable for the service intended, screwed ends, and shall be as manufactured by Jenkins, Walworth or approved equal.

4. Globe valves 2-1/2 inch diameter and larger shall be ANSI Class 150 iron body, bronze mounted, OS & Y valves with regrind-renew beveled bronze disc and seat ring, flanged ends, as manufactured by Jenkins, Walworth or approved equal.

5. Check Valves

   a. Horizontal swing check valves 2 inches and under shall have ANSI Class 150 WSP bronze bodies and trim, screwed ends, intergral bronze seat, regrindable bronze disc and screw-in cap as manufactured by Jenkins, Walworth or approved equal.

   b. Horizontal swing check valves 2-1/2 inch and larger shall be ANSI Class 150 iron body bronze mounted, flanged ends, replaceable bronze seat, renewable, regrindable bronze disc and bolted cover as manufactured by Jenkins, Walworth or approved equal.

c. Vertical lift check valves 2 inches and smaller shall have ANSI Class 150 bronze bodies and trim, screwed ends, integral bronze seat, renewable composition disc and screw-over cap as manufactured by Jenkins, Walworth or approved equal.

d. Vertical lift check valves 2-1/2 inch and larger shall be silent type with semi-steel, 150 pound body, replaceable soft bronze seat and plug, stainless steel spring and retaining screws, as manufactured by Combination Pump and Valve Company, Prince Valve Company, Mueller or approved equal.

6. Butterfly Valves

a. Butterfly valves 2-1/2 inch to 12 inch size shall have ANSI Class 150 self-aligning, semi-lug wafer type cast iron bodies with resilient EPDM seat, 416 stainless steel shaft with acetal bushings, aluminum-bronze disc and infinite position lever operator, as manufactured by Jamesbury, Jenkins or approved equal.

b. All valves shall be rated for a pressure of not less than ANSI Class 150 and each valve shall be factory tested to 110% of its rating. Seat material shall be EPDM capable of operating temperature from -40°F to $+250^{\circ}$F. Valves shall have a body neck extended 2 inches to permit the application of insulation without interference with valve actuator.

7. Plug Valves (Balancing or Throttling Valves)

a. Plug valves 2 inch size and smaller shall have ANSI Class 150 H.C.I. bodies, screwed ends, teflon coated plug, plug retainer plate, separate gland adjustment and shall be wrench operated. Valves shall be provided with proper lubricant and not less than 2 wrenches for each valve size. Valves shall be as manufactured by Walworth, Rockwell-Nordstrom or approved equal.

b. Plug valves, 2-1/2 inch to 5 inch size shall have ANSI Class 150 semi-steel bodies, 125 pound flanged ends, teflon coated tapered plug, plug retainer plate, bolted gland adjustment and wrench operators for up to 5 inch. Valves shall be provided with proper lubricant and not less than 2 wrenches for each valve size. Valves shall be Walworth, Rockwell-Nordstrom or approved equal.

c. Plug valve bodies shall be capable of accommodating thermal insulation without interfering with the operation of the valve.

8. Drain Valves

   a. Furnish and install a 3/4 inch drain valve with cap and chain at each low point of the water systems, at each strainer blow-out connection and wherever else indicated on the drawings. Drain valves shall be Walworth Co. Fig. 24, or approved equal.

9. Ball Valves

   a. Ball valves 2 inch diameter and smaller shall have bronze body rated for 150 psi, similar to Jenkins Fig. 32.A.

   b. All valves shall include TFE seat packing and gasket and Type 316 stainless steel ball and stem and shall be as manufactured by Jenkins or approved equal.

B. Sprocket Rims and Chains:

   1. A sprocket rim and chain shall be furnished and installed on each hand operated, flanged valve which is inoperable from the floor. Sprocket rims and drains shall be installed by this Contractor.

C. Valve Service:

   1. All water system shut-off valves 2 inch diameter and smaller, unless otherwise noted, shall be ball valves.

   2. All water system shut-off valves 2-1/2 inch diameter and larger, unless otherwise noted, shall be butterlfly valves.

2.03 GASKETS

A. Unless otherwise specified, make up flanged joints with one piece ring gaskets, 1/16 inch thick. For hot water piping, use equivalent composition to asbestos. For cold water piping, use rubber composition.

B. Asbestos or similar material composition gaskets shall not be used.

C. Gaskets shall be similar to Garlock, Crane, Johns-Manville.

2.04 FLANGED AND THREADED CONNECTIONS

A. Welded Piping: Use steel, welding neck pattern flanges, 150 psi WSP Class ANSI B16.5; ASTM A-181 - Grade I.

B. All flanges shall be faced and drilled to "U.S. Standard" and fitted with machine bolts of proper numbers and size, with semi-finished hex nuts and washers.

C. All screwed joints shall be made tight with teflon tape, teflon compound applied to male threads or other approved method.

2.05 PIPE SLEEVES AND ESCUTCHEONS

A. This Contractor shall be responsible for the location of and maintaining in proper position, sleeves, inserts and anchor bolts supplied and/or set in place by him. In the event that failure to do so required cutting and patching of finished work, it shall be by and done at the expense of this Contractor.

B. All pipes passing through masonry walls, gypsum board fire walls or concrete walls or floor slabs shall be fitted with fireproof wall and floor sleeves as manufactured by Pipe Shields Inc. Hot water piping shall be fitted with model WFB-CS through walls and DFB-CS through floors. All floor sleeves and wall sleeves shall be sized to provide a fiberous material insulation section in the annular space equal to the adjacent thickness of insulation as specified in this section of the specifications under paragraph: "INSULATION". Floor sleeves through mechanical equipment room floor slabs shall be long enough to pass through the slab, 4 inch housekeeping pad and allow 1" above the top of the pad, and shall be schedule 40 steel pipe. All other floor sleeves shall extend 3" above floor and be sealed water tight.

C. All pipes passing through walls, floors and ceilings, except piping concealed above suspended ceilings shall be fitted with chromium plated spun or split type escutcheons with a clamping device for holding the escutcheons in position. Floor escutcheons shall be designed to cover the pipe sleeves and rest upon the finished surface.

2.06 HANGERS AND SUPPORTS

A. Furnish and install pipe supports, hangers and other devices necessary to support firmly and substantially the piping and the apparatus described in this specification.

B. Where the weight of piping or other apparatus makes it impracticable to support the same from the building structure above flanged piping supports shall be installed to support the weight of piping, valves and fittings.

C. Piping shall be provided with steel insulation protection shields at each hanger. The shields shall be 180 degree rolled segments installed outside the vapor barrier. The shield length and gauge thickness shall be as follows:

Pipe Size	Length	Gauge
1-1/2 inch and smaller	6 inch	24
2 inch - 5 inch	12 inch	20

D. All other piping shall be provided with pipe covering protection saddles tack welded to the pipe at each hanger.

E. All piping shall be supported by Worcester hangers as manufactured by Carpenter Patterson, Grinnell Corp., Calco Steel Products Co.

The hanger shall be installed outside the covering on insulated pipe. The rod size and hanger shall be as follows:

Pipe Size	Hanger	Rod Diameter	Maximum Spacing
1-1/4" and smaller	Clevis Hanger	3/8"	8'-0"
1-1/2" and 2"	Clevis Hanger	3/8"	10'-0"
2-1/2" to 3-1/2"	Clevis Hanger	1/2"	12'-0"
4" to 5"	1 Rod Roll Hanger	5/8"	14'-0"

F. Maximum hanger spacing indicated above is for straight runs of pipe. Hangers shall be spaced more closely as required by changes in directions of piping, location of valves, and other devices and the building structure. This Contractor shall provide supplementary steel as required to support piping and equipment.

G. Where the weight of piping or other apparatus makes it impracticable to support same from overhead, flanged pipe standards with chair roll supports shall be used.

H. Where installation conditions necessitate, two rod roll hangers shall be used in lieu of the hanger specified.

I. Clevis hangers shall be Carpenter and Patterson Fig. No. 100.

J. One rod roll hanger shall be Carpenter and Patterson Fig. No. 140.

K. Two rod roll hangers shall be Carpenter and Patterson Fig. No. 142.

L. Chair roll supports shall be Carpenter and Patterson Fig. No. 40.

M. Pipe covering protection saddles shall be Carpenter and Patterson Fig. No. 351, 352, 353 or 354 depending on the thickness of the insulation.

N. Furnish vibration hangers as specified in the article of this specification entitled "VIBRATION CONTROL".

O. Hangers for copper tubing shall be copper plated 1-A bands with 3/8" hanger rods and beam clamps spaced on 10'-0" centers.

P. Piping shall not be supported from ductwork or from other piping.

Q. Pipe guides shall be Carpenter and Patterson Fig. No. 1007 split sleeve steel type suitable for use with insulation thickness of piping in which they are installed.

R. Vertical piping shall be supported by wrought iron riser clamps or base elbows as indicated on the drawings.

S. All adjustable hangers shall be provided with lock nuts.

2.07 EXPANSION COMPENSATORS

A. Furnish and install expansion compensators in the hot water piping where indicated on the drawings. The compensators shall be Keflex Type 7Q, Flexonics Model H.

B. Keflex Type BA anchors and Type B guides shall be installed for each compensator as indicated on the drawings. Guides and anchors shall be supported inside the enclosure on Type BH hangers.

C. The compensators shall be installed in strict accordance with the manufacturer's recommendations.

2.08 EXPANSION LOOPS, ANCHORS AND GUIDES

A. Provisions for expansion in piping mains, branches and risers shall be made by the installation of offsets, expansion loops, or compensators as indicated on the drawings and as required.

B. All piping with loops, or compensators shall be anchored so as to direct all expansion toward the loops, or compensators.

C. Guides shall be installed on both sides of each expansion loop and compensators as indicated on the drawings. Guides shall be constructed as shown in the details on the drawings and shall be Keflex Type P pipe alignment guides.

D. Anchors and guides shall be secured to beams. They shall not be secured to roof or slab decking.

E. All piping with loops shall be anchored so as to throw all expansion toward the loops.

F. Anchors shall be constructed as shown on the drawings.

2.09 STRAINERS

A. Furnish and install a full size Y-pattern strainer on the inlet side of each temperature control valve, each pressure reducing valve, each water circulating pump and where indicated on the drawings except at finned tube radiation locations.

B. Unless otherwise specified, the strainers shall have cast iron or bronze bodies of ample strength to withstand without failure the pressures to which they shall be subjected. They shall have removable cylindrical or conical screens of nickel, copper or brass, and suitable flanges or tappings for connections to the piping they serve. They shall be of such design as to allow blowing out of the accumulated dirt, and to facilitate removal and replacement of a strainer screen without disconnecting the main piping. The strainers on the inlet side of each of the water circulating pumps shall have 40 mesh screens.

C. An approved 1 inch valved dirt blow-out connection shall be made to each strainer, with the gate valve with Jenkins Fig. 372 and Fig. No. 658 cap and chain located six inches to twelve inches below the strainer. In the case of strainers under full water pressure the blow-out connection shall terminate at a point where there will be no danger to personnel or risk of flooding or damage. Valve location shall be no higher than 7' above floor.

D. Strainers 2 inch diameter and smaller shall have screwed ends similar to Sarco Co. Type AT. Strainers 2-1/2 inch diameter and larger shall have flanged ends similar to Sarco AF-125.

E. Where installation conditions necessitate, basket-type strainers with baskets removable from the top, shall be used.

F. The strainers shall be as manufactured by Strong, Armstrong Co., Barnes and Jones, Inc., Mueller or Sarco.

2.10 PRESSURE GAUGES

A. Furnish and install, where shown on the drawings and specified herein, Bourdon Spring type pressure gauge as manufactured by Manning, Maxwell and Moore, Inc., Lonergan Co., H.O. Trerice Corp.

B. The gauges shall be designed for surface mounting with back connections where mounted on panels and shall have white faces with black filled engraved letters. The body of the gauge shall be dull black with the bezel or rim chrome plated. Where gauges are mounted on panelboards, an engraved nameplate shall be mounted below each gauge to identify its service. The nameplate shall be chrome plated with black filled letters. Gauges not mounted on a panelboard shall have their identifying service engraved on the face of the gauge. The accuracy of the gauge shall be within 1 percent of the scale range.

C. A T-handle gauge cock shall be furnished and installed on the system side of each gauge for shut-off purposes.

D. A pressure gauge shall be furnished and installed in the suction and discharge of each water pump, and L.P. and H.P. side of each pressure reducing valve and where indicated on the drawings.

E. All gauges on water lines shall be fitted with pressure gauge snubbers as manufactured by U.S. Gauge Co., Manning, Maxwell and Moore, Inc., The Marshalltown Mfg. Co., H.O. Trerice Co.

F. Pressure gauges on water lines shall have 4-1/2 inch dials.

G. The scale range for pressure gauges shall be 0 to 150 psig.

H. Gauges suspected of being inaccurate shall be tested and replaced if inaccuracy is verified.

2.11 THERMOMETERS AND WELLS

A. Furnish and install, where shown on the drawings and where specified herein, separable well type, industrial thermometers as manufactured by Manning, Maxwell and Moore, Inc., Taylor Industrial Co., Moeller Instrument Co.

B. The thermometers shall have a nine inch scale and a white face with black filled engraved letters. They shall be angle or straight stem type as conditions necessitate.

C. All thermometer wells shall be installed in such a manner that a minimum of restriction will be caused to the flow in the pipes so that the thermometers can be easily read.

D. Install thermometer wells adjacent to each throttling valve and where shown on the drawings and as indicated herein.

E. Where installation conditions necessitate that a thermometer be installed higher than seven feet above the floor a remote bulb dial thermometer shall be installed where directed by the Architect. The thermometers shall have six inch dials and shall be vapor or mercury actuated and shall have separable wells.

F. The scale range for thermometers shall be 30°F - 240°F.

G. All instrument wells and valved connections for controls and indicators, furnished by the Automatic Temperature Control Subcontractor, shall be installed by this Contractor.

H. Accuracy shall be within 1 percent of scale range. Thermometers suspected of being inaccurate shall be tested and replaced if inaccuracy is verified.

2.12 AIR VENTS

A. Furnish and install a manual air vent with test petcock at each local high point in the water piping mains. Furnish and install a gate valve on the system side of each automatic air vent. The air vents shall be manufactured by Bell & Gossett, Taco, Watts or Armstrong.

Automatic air vents located above hung ceilings shall be fitted with drain piping to floor drain or service sink.

B. Automatic air vents in mechanical equipment rooms shall be piped to condensate drain pans or floor drains.

C. Furnish and install manual air vents for all upfed radiation, each unit heater, cabinet heater and where indicated on the drawings. Furnish and install a petcock on the system side of each manual air vent.

2.13 AIR SEPARATORS

A. Furnish and install air separators for the hot water system where indicated on the drawings. The separators shall be as manufactured by Bell & Gossett, Taco, Thrush.

B. The units shall be of ASME construction and shall be stamped 125 psig W.P.

C. The units shall be complete with integral strainers and collecting screen and 1 inch drain valve.

D. The units shall be of the sizes indicated on the drawings and shall be installed in strict accordance with the manufacturer's recommendations with supplementary steel supports.

2.14 DIRT POCKETS

A. Provide dirt pocket at bottom of each hot water riser and where indicated, not smaller than full size of riser and not less than 12 inches long.

B. Provide in each dirt pocket, 1 inch hose ball valve, with cap and chain.

2.15 FLOW STATIONS

A. Furnish and install venturi type flow stations at each water pump suction or discharge and as indicated on the drawings. The stations shall be used to set proper water quantities in piping. One portable master flow meter set shall be provided. Meter shall become the property of the Owner. The flow stations shall be manufactured by Aeroquip Corporation, BIF or approved equal.

B. Each primary flow element shall be a Venturi selected from manufacturers' engineering data to permit prescribed flow at a minimum head loss. For maximum accuracy and minimal turbulence in recovery area and thus low pressure loss, Venturi's shall have a minimum length of 1.6 x pipe diameter. The beta ratio shall be selected to allow for a differential pressure compatible with the meter as specified herein and insure a properly calibrated system accuracy within 1% throughout the entire range. This accuracy must be obtained with as little as five (5) pipe diameters of straight pipe upstream and two (2) diameters downstream from the Venturi. Each Venturi shall be furnished with two (2) accurately located built-in sensing traps, nipples, shut-off valves and quick connect couplings. Venturi's shall be complete with identification tag on chain, giving pipe size, Venturi series, station identification, and meter reading at specified flow rate, versus differential curves and installation instructions.

C. Venturi stations shall be one-piece bronze threaded 1/2" through 2-1/2". Sizes 3" through 10" shall consist of one-piece cadmium plated cast steel Venturi with weld neck ends.

D. Venturi sizes and beta ratios shall be selected so that design flow rates shall read between 20% and 80% of the full scale range on a linear meter (e.g. between 10" and 40" on a 0-50" meter) with permanent pressure loss of not more than 25% of indicated flow rate differential pressure.

E. The indicating meter shall be portable type with 6" round dial, 270 degrees indication. It shall be the dual rupture-proof liquid filled bellows type with integral temperature compensation. The meter shall have over-range protection in either direction equal to the working pressure equivalent of the instrument housing (250 psig at 250 degrees F). The accuracy of the meter shall be no less than 0.5% full scale. The meter case shall be waterproof and coated with appropriate paint. It shall have external zero and range adjusting screws and life long lubrication. Scale shall be calibrated uniformly either in differential pressure (0-50"); percent of flow; directly in GPM.

F. Portable Master Meters shall be mounted in a durable metal reinforced plastic carrying case with the following accessories:

1. Two (2) 10" lengths of connecting hose, each with color coded quick connect couplings compatible with the Venturi coupling.

2. Two (2) brass blow-down valves with Buna-N seals.

3. Blow-down hoses.

4. Instruction book with Flow Vs. Differential curves.

2.16 RADIATION

A. Radiation:

1. Provide hot water perimeter radiation of the size and capacity as shown and scheduled on the drawings and as described. Heat output shall be 800 BTUs per hour per foot minimum.
2. Radiation shall be as manufactured by Slant/Fin, Sterling, Standard Fin Pipe Radiator Corporation, or approved equal.

3. Furnish and install baseboard cover assembly as manufactured by Slant/Fin Corporation, consisting of one-piece bottom, back and top panel, and one-piece front panel, formed of cold rolled steel. Room control damper vane shall be provided for each length of enclosure, and shall modulate fully and freely, yet retain any setting through its arc without protruding knobs, chains or other devices. Damper shall swing in position on damper pivots inserted in dieformed slots at top of support bracket. All cover components shall be painted in shell white, amino modified alkyd polyester finish, based at 500°F. Baseboard cover to be 14 gauge AWG.

2.17 PUMPS

A. General:

1. The water systems will be cleaned and tested with a water treatment as specified hereinafter in this Specification. It shall be the responsibility of this Contractor to coordinate with the Water Treatment Specialist and the pump manufacturer to be assured that the normal life of the pumps and their related parts will not be deteriorated by the water treatment.

2. Shop drawings and complete performance curves for each pump shall be submitted for approval.

3. The pressure drops through various apparatus, which was used in calculating the dynamic head of the pumps, are indicated in the schedules on the drawings. If apparatus with pressure drops other than those indicated are selected and approved, it shall be the responsibility of this Contractor to modify the pump head characteristics accordingly and to furnish pumps with the required capacity. Additional costs caused by revising the pumps heads as described above shall be borne by this Contractor.

4. Pumps shall be as manufactured by Bell & Gossett, Aurora, Weinman or approved equal. Each pump shall be factory tested.

5. Pumps shall be selected so that the operating point on the impeller curve will be within 3 percentage points of the point of maximum efficiency for the impeller selected.

B. In-Line Pumps:

1. Furnish and install as shown on the plans. In-line pumps shall be Taco as scheduled or approved equal.

2. The pump shall be single stage, vertical split case design, in cast iron bronze fitted construction. The pump internals shall be capable of being serviced without disturbing piping connections. The impeller shall be of the enclosed type, hydraulically and dynamically balanced and keyed to the shaft and secured with a suitable locknut.

3. The pump shall employ a mechanical seal, with a carbon seal ring and ceramic seat. A shaft sleeve shall be furnished under the complete wetted areas of the mechanical seal.

4. The bearing frame assembly of the pump shall be fitted with oil lubricated, bronze journal bearings and a hardened alloy steel shaft.

5. A flexible coupling, capable of absorbing torsional vibration, shall be employed between the pump and motor.

6. The motors through 2 HP shall be resilient mounted equipped with oil lubricated journal bearings. 3 HP motor shall be rigid mounted with ball bearings.

7. The pump shall be factory tested, toroughly cleaned and painted with one coat of machinery enamel prior to shipment. A set of installation instructions shall be included with pump at the time of shipment.

2.18 HOT WATER UNIT HEATERS

A. Casing shall be manufactured from heavy gauge steel, phosphatized, baked enamel finished. Finish as approved by Architect.

B. Fan shall be designed and built for high efficiency with aluminum blades, factory balanced.

C. Coils shall be constructed with steel headers. Fins shall be aluminum mechanically bonded to seamless copper tubing. Coils shall be tested at 300 psig air under water.

D. Motors shall be totally enclosed, insulated and with sleeve or ball bearing. All single phase motors shall have built in overload protection. Sleeve bearing motors shall be oiled and ball bearing motors shall be permanently lubricated.

E. Louver fin diffuser shall be used for versatility and provide 4 direction control.

2.19 HOT WATER CABINET UNIT HEATERS

A. Basic unit shall include chassis, coil, fanboard, fan-wheel housing, motor and insulation. Chassis shall be galvanized steel wrap-around structural frame with all edges flanged. Insulation shall be faced, heavy density glass fiber.

B. All cabinet parts shall be cleaned, bonderized, phosphatized and flow coated with baked on primer. Final finish of spray applied baked on enamel approved by Architect.

C. The units shall be free standing or recessed, vertical or horizontal as indicated on drawings. Cabinet shall be of 16 or 18 gauge steel. Unit access shall be provided.

D. Water coils shall be 5/8" OD seamless copper tubes mechanically bonded to configured aluminum fins with continuous fin collars and sleeved coil end supports. Maximum working pressure shall be 300 psig, factory burst test 450 psig (air) and leak test 300 psig (air under water). Supply and return connections shall be on same side of units on all models and sizes.

E. Fan wheels shall be centrifugal, forward curved, aluminum. Fan housing shall be galvanized steel.

F. All motors shall have integral thermal overload protection and start at 78% of rated voltage. Motors shall operate satisfactorily at 90% of rated voltage on all speed settings and at 10% over voltage without undue magnetic noise. Temperature rise by winding resistance method shall not exceed 60C (shaded pole motors) and 50C (PSC motors) on high speed. All motors shall be factory run tested assembled in unit prior to shipping.

G. Filters shall be removable by horizontal units by pivoting hinged bottom panel and shall be of 3/4" or 1" replaceable media of woven glass fiber with 3/4" or 1" permanent aluminum frame.

H. All units shall be wired in accordance with National Electric Code, Underwriters' Laboratories, Inc. listed. Junction box for motor cord shall be provided.

I. Accessories:

1. Unit levelers shall be refrigerator type bolts, available on vertical models.

2. Recessing flanges of 18 gauge steel for recessing horizontal cabinet into ceiling shall be provided.

3. Tamperproof access doors shall be provided on vertical cabinets.

4. Motor starters shall be isolated from electric power source for maintenance. Thermal overload device shall protect motor. Overload mechanism shall be reset by moving toggel switch to "off" and then to "on" position.

5. Totally enclosed transformers with Class A insulation to step down available power voltage to 115 volts for motor control circuit shall be provided if required. Transformer shall be factory mounted on units.

6. Built-in, factory wired speed switch.

7. Built-in, factory wired adjustable return air thermostat to cycle the fan.

2.20 SHEET METAL ductwork shall be constructed of galvanized steel sheets or aluminum sheets where indicated. Unless otherwise indicated on the drawings or specified herein, sheet metal ductwork shall comply with SMACNA "Low Pressure Duct Construction Standards" and "High Pressure Duct Construction Standards". Ductwork shall be suitable for low or high velocity systems as hereinafter specified. Low velocity systems shall be applied to systems where the range of static pressure existing in the duct is 2 inches water gage or less. The term high velocity systems shall be applied to systems where the range of static pressure existing in the duct varies from 2 inches through 10 inches water gage and where indicated on the drawings. The air velocity in the low velocity system shall be generally 2,000 FPM or less. Unless otherwise approved, ducts shall conform accurately to the dimensions indicated; duct dimensions indicated on drawings are clear air flow inside diameter duct dimensions, and shall be straight and smooth on the inside, with joints neatly finished. Where aluminum is welded, minimum thickness shall be 16 gage and welding shall be accomplished by the metallic arc or acetylene process. Ducts shall be anchored securely to the structural slab or framing in the building and the method of anchoring and/or fastening shall be detailed on the layout drawings. Ducts shall be so constructed and installed as to be completely free from vibration under all conditions of operation. Supports shall be attached only to structural framing members and concrete slabs. Where supports are required between structural framing members, suitable intermediate metal framing shall be provided and detailed. Where C-clamps are used, retainer clips shall be provided. Friction clamps indicated in Figure 5.2 SMACNA "Low Pressure Duct Construction Standards" shall not be used.

A. Duct Construction:

1. Curved elbows shall have a centerline radius not less than 1-1/2 times the width or diameter of the duct.

    a. Joints for low velocity ducts shall be made substantially air tight, and no dust marks from air leaks shall show at duct joints, or connections to grilles, registers and diffusers. Joints for supply ducts shall be sealed with 3M sealer or hard cast and taped along all seams.

    b. Laps at the joints for low velocity system shall be made in the direction of air flow. Button Punch Snap Lock will not be permitted.

    c. Transformations shall be made with sides pitched not to exceed a maximum of 20 degrees, 40 degrees included angle, for diverging air flow and 30 degrees, 60 degrees included angle, for converging air flow, or as indicated on the drawings. Factory fabricated reducing fittings for low and high velocity systems using round and oval duct sections when formed to the shape of the ASME short flow nozzle need not comply with the maximum included angles specified.

    d. Square elbows, fittings, and branch take-offs for low and high velocity systems shall be designed, constructed and installed as recommended in SMACNA publication, "Low Pressure Duct Construction Standards" and "High Pressure Duct Construction Standards".

    e. Other details of duct construction, casing construction, access doors, hangers, anchors, and supports, duct joints, volume dampers, duct connections penetration of casing, casing curb detail, and hood construction, unless otherwise indicated on the drawings or specified herein, shall be as set forth in the SMACNA publication, "Low

Pressure Duct Construction Standards" and "High Pressure Duct Construction Standards".

2. Duct piercing roof: Flashing, unless otherwise indicated, shall be provided by others and as detailed in the duct manuals referenced herein.

   a. Flashing and counter flashing where ducts pierce roof construction is provided by others as specified under the roofing section of the specifications.

   b. Flashing for curbs is provided by others as specified under the roofing section of the specifications.

3. Dampers: Dampers shall have an accessible operating mechanism. Where operators occur in finished portions of the building, they shall be chromium plated with all exposed edges rounded. Manual volume control dampers shall be operated by locking type quadrant operators. Dampers shall be two gages heavier than the duct in which installed. Unless otherwise indicated, multileaf dampers shall be opposed blade type with maximum blade width of 12 inches (30cm). Access doors or panels shall be provided for all concealed damper operators and locking setscrews. Unless otherwise indicated, the locking type quadrant operators for dampers, when installed on ducts to be thermally insulated, shall be provided with stand off mounting brackets, bases or adapters to provide clearance between the duct surface and the operator not less than the thickness of the insulation. Stand off mounting items shall be integral with the operator or standard accessory of the damper manufactuer. Volume dampers shall be provided where indicated on the drawings, and as required for system air balancing.

4. Fire dampers shall conform to UL 555. Fire dampers shall be provided for two hour partitions, floors and walls where shown and required in ducts passing through one hour partitions or walls. Fire dampers shall be provided in ducts passing through walls, floors or ceilings of mechanical rooms. Ducts providing service to two or more floors shall be located in a fire rated chase, equipped with fire dampers. Fire dampers shall be automatic operating type approved for the protection of openings in one and two hour fire rated walls and partitions and shall be installed in accordance with the conditions of their approval and the manufacturer's instruction. Hinged or unhinged access doors shall be provided in the ducts to make all fire doors and fire dampers accessible for inspection and maintenance, and shall conform to the requirements of Plate entitled "Fire Damper Access Doors" of SMACNA "Low Pressure Duct Construction Standards". Ductwork in fire rated floor or ceiling assembly system with air ducts that pierce the ceiling of the assembly shall be constructed in conformance with designs in Underwriters' Laboratories, Inc., Fire Resistance Index. Other designs that have been tested by an approved, independent, nationally recognized testing organization and

comply with the requirements set forth in NFPA No. 90A are acceptable. Unless otherwise shown, the installation details given in SMACNA Fire Damper Guide for fire dampers shall be followed except minimum thickness metal for all sleeves provided for fire dampers shall be not lighter than 14 guage. All accessory items associated with the fire dampers such as retaining angles, sleeves, breakaway connections and access doors shall be provided. Stacked blades and damper frame shall not obstruct duct.

5. Duct access doors: Access doors shall be provided at all automatic dampers, fire dampers, smoke dampers, smoke detectors, coils, thermostats, and other apparatus requiring service and inspection in the duct system, and unless otherwise shown on the drawings shall conform to SMACNA Duct Construction Standards. In the case of heating and cooling coils access doors shall be provided upstream and downstream of the coil. Doors shall be 15 by 18 inches (38 by46cm) unless otherwise indicated. Where duct size will not accommodate this door size, the doors shall be made as large as practical. Doors 24 by 24 inches (61 by 61cm) or larger shall be provided with fasteners operable from both sides. Doors in insulated ducts shall be of the insulated type. Unless otherwise indicated, doors shall so swing that fan pressure or suction holds the door closed.

6. Duct test holes: Holes with patches or threaded plugs in ducts and plenums shall be provided where directed or necessary for using pitot tubes for taking air measurements to balance the air systems. At each of these locations where ducts or plenums are insulated, extension shall be provided with plug fittings.

7. Flexible duct connections: Where sheet metal connections are made to fan or where ducts of dissimilar metal are connected, and at building expansion joints, a flexible material of inorganic elastomeric compound coated glass fabric approximately 6 inches (152.2cm) in width shall be installed. The flexible material shall be securely fastened by zinc coated iron clinch type draw bands for round ducts. For rectangular ducts the flexible fabric locked to metal collars shall be installed using normal duct construction methods.

8. Duct sleeves and framed prepared openings: Duct sleeves shall be provided for all round ducts 15 inches (38cm) diameter or less passing through floors, walls, ceilings or roof and shall be installed during construction of the floor, wall, ceiling or roof. Round ducts larger than 15 inches (38cm) diameter and all square and rectangular ducts passing through floors, walls, or ceilings or roof shall be installed through prepared openings. All square and rectangular ducts passing through bearing walls and partitions shall be installed in sleeves. The Contractor shall be responsible for the proper size and location of sleeves and prepared openings. Duct sleeves and prepared openings shall be provided for all duct mains and

duct branches. Branch take off connections to grilles, registers, and diffusers shall be in accordance with SMACNA "Low Pressure Duct Construction Standards".

a. Duct sleeves for square and rectangular ducts, shall be fabricated from 20 gage nominal thickness, galvanized sheet steel, unless otherwise indicated. Ducts sleeves for round ducts installed in bearing walls or partitions, black steel pipe, Schedule 30, 40, or standard weight, shall be used. There shall be 1 inch (25mm) clearance between the duct and the sleeve or 1 inch (25mm) clearance between the insulation and the sleeve for insulated ducts, except at grilles, registers, and diffusers.

b. Framed prepared openings for round ducts larger than 15 inches (38cm) in diameter and for all square and rectangular ducts shall provide 1 inch (2.5cm) clearance between the duct and the opening or 1 inch (2.5cm) clearance between the insulation and the opening for insulated ducts, except at grilles, registers, and diffusers.

c. Closure collar of galvanized sheet metal not less than 4 inches (10cm) wide unless otherwise indicated on the drawing shall be provided for exposed ducts on each side of walls or floors where sleeves or prepared openings are provided except where grilles, registers or diffusers are installed. The collar shall be installed tight against the surface. The collar shall fit snugly around the duct or insulation. The sharp edges of the collar installed around insulated duct shall be ground smooth to preclude tearing or puncturing the insulation covering or vapor barrier. Collars for round ducts 15 inches (38cm) in diameter or less shall be fabricated from 20 gage nominal thickness, galvanized steel. Not less than 4 nails shall be used to attach collars where the opening is 12 inches (30cm) in diameter or less, and not less than 8 nails shall be used where the opening is 20 inches (51cm) in diameter or less. Collars for square and rectangular ducts with a maximum side of 15 inches (38cm) or less shall be fabricated from 20 gage nominal thickness, galvanized steel. Collars for round, square and rectangular ducts with minimum dimension over 15 inches (38cm) shall be fabricated from 18 gage, 0.0516 inch (1.3mm) in nominal thickness, galvanized steel. Collars shall be installed with nails on maximum 6 inch (15cm) centers.

d. Space between the sleeve or opening and the duct or duct insulation shall be packed with fibrous material.

9. Duct supports shall be not less than two 1 inch (25mm) by 1/16 inch (1.6mm) thick galvanized strap iron hangers spaced one on each side of the duct in accordance with SMACNA "Low Pressure Duct Construction Standards". Supports on the risers will allow free vertical movement of the duct.

10. Sheet metal work that extends to the floor shall have its corners protected by installation of corner angles securely fastened over covering. Corners of all air conditioning apparatus shall be protected in a similar manner. Furnish to the Insulation Contractor random lengths of 1-1/2 by 1-1/2 inch, 26 gauge galvanized angles for insulation protection.

11. Sealants and Connections

    a. All ductwork shall have transverse joints sealed air tight with Minnesota Mining EC800 sealer or hard cast.

2.21 REGISTERS AND GRILLES shall be factory fabricated of steel or aluminum and shall distribute the specified quantity of air evenly over space intended, without causing noticeable drafts, air movement faster than 50 FPM (15.2mpm) in occupied zone, or dead spots anywhere in the conditioned area. Registers and grilles shall be as manufactured by Titus, Krueger, Carnes or approved equal. The Contractor shall be responsible for diffusion, spread, drop, and throw. If, according to the certified data of the manufacturer of the proposed units, the size indicated on the drawings will not perform satisfactorily, the units shall be reselected to perform quietly and effectively in accordance with the manufacturer's recommendations. A schedule of all air inlets and outlets shall be submitted indicating location, types, specified air quantity, neck or face velocity, sound power level values, pressure drop, throw and drop for registers. The inlets and outlets shall be sound rated and certified in accordance with Equipment Test Code Standard 1062R2 of Air Diffusion Council in sound power level, decibels reference 10-12 watt, in octave bands 2 through 8. Registers shall be provided with an opposed blade volume controller with accessible key operator. Provide two keys for each type unless otherwise indicated on the drawings, or if standard with the manufacturer an automatically controlled device will be acceptable. After the system is in operation, if drafts, dead spots, or excessive noise are noticeable in the conditioned spaces due to improper selection of type and size of grille or register, the unit shall be changed to the proper size and type without additional cost. Where the inlet and outlet openings are located less than 7 feet (2.2 meters) above the floor, they shall be protected by a substantial grille or screen in accordance with NFPA No. 90A. All registers and grilles shall be factory finished painted with baked on enamel of a color to match adjacent spaces.

A. Registers shall be four way directional control type. However, return and exhaust registers may be fixed horizontal louver type similar in appearance to the supply register face unless otherwise indicated. Registers shall be provided with sponge rubber gasket between flanges and wall or ceiling. Wall supply registers shall be installed at least 6 inches (15cm) below the ceiling, unless otherwise indicated. Return and exhaust registers shall be located at a minimum of 6 inches (15cm) above the floor unless otherwise indicated. Four way directional control may be achieved by a grille face which can be rotated in four positions or by adjustment of horizontal and vertical vanes.

B. Grilles shall be as specified herein for registers, without volume control damper.

C. Return grilles and registers shall be set at 45° so as to minimize the view through the blades.

1. Blank off baffles shall be provided where indicated on the drawings or as required for draftless air distribution through the blades. Carefully review the drawings and provide double equalizing deflectors or other types of devices as recommended by the suppliers of the diffusers to produce draftless diffusion of air in areas where walls, columns, and beams interrupt the normal diffusion pattern.

2. Air scoops or air volume extractors shall be provided for grilles, registers, and branch takeoffs where required.

2.22 LOUVERS in exterior walls will be provided by the General Contractor.

A. This Contractor shall provide blank-off panels at all unused portions of the louvers.

1. The panels shall be of sandwich construction with 2 inch thick rigid fiberglass insulation between two 18 gauge aluminum sheets.

2. All reinforcing members and stiffeners shall be aluminum. All fasteners shall be stainless steel.

3. The panel facing outside shall be painted two coats of an approved flat black enamel.

4. All joints between the outside wall and the panel shall be sealed with an approved caulking.

2.23 FANS

A. Ceiling Fans:

1. Furnish and install the ceiling exhaust fans as indicated on the drawings and as specified here.

2. The fans shall be as manufactured by Broan, Ventilator Co., Inc. or approved equal.

3. All units shall be certified for sound and air by the Air Movement and Control Association, Inc. in compliance with AMCA Standard 210 and Standard 300 of the AMCA Certified Ratings Program.

4. Outer box and housing shall be fabricated of galvanized steel and shall be acoustically insulated for quiet operation. Unit housing shall be installed to provide accessibility and removal of motor and blowers without removing housing from the system.

Blowers and motors shall facilitate easy take down by removable fasteners. Motors shall be permanently lubricated. Units shall have accessible internal wiring box with receptacle.

5. All accessories used for installation of this model fan shall be of the same manufacturer, unless otherwise indicated.

6. The fans shall have the capacities as scheduled on the drawings and the fans shall be installed in accordance with manufacturer's recommendations.

B. Propeller Fans:

1. Furnish and install propeller fans where shown on the drawngs.

2. Unless otherwise noted on the drawings, the propeller fans shall be heavy duty industrial type, belt driven with fan guard.

3. The propeller fans shall have the capacities listed in the schedule on the drawings.

4. Fans without automatic backdraft dampers shall be provided with electrically motorized dampers.

5. The fan motors shall be provided with thermal overload protection and disconnect switches.

6. The propeller fans shall be as manufactured by Penn, Cook, Peerless or approved equal.

C. Turbine Ventilators:

1. Furnish and install turbine ventilators as indicated on the drawings and as specified herein.

2. Ventilators shall be as manufactured by Uno Ventilator Company or approved equal.

2.24 INSULATION

A. General:

1. Furnish and install covering and insulation of the types hereinafter specified on piping, ductwork and equipment.

2. All sealers, solvents, tapes, adhesives and mastics used in conjunction with the installation of all insulation specified under this section of the specifications shall possess the maximum possible fire-safe qualities available and shall be of a type as approved under NFPA, IRI and FM standards.

3. Insulation shall not be installed on piping or ductwork until it has been tested and proven tight. Adhesives, sealers and

mastics shall not be applied when the ambient temperature is below 40 degrees F.

4. All piping, ducts, and equipment shall be dry and free of dust, grease and other foreign matter before insulation is applied.

5. At all openings in insulation, protect insulation edges with neatly applied metal frames.

6. Neatly butt all edges of insulation.

7. Fill all voids with insulating cement.

8. All longitudinal overlap in exposed work shall be toward ceiling or wall.

9. Insulation on work passing through sleeves or other openings shall be continuous through the sleeve or opening.

10. Where specified thickness of insulation exceeds available thickness, provide insulation in two layers with all joints staggered.

11. Insulation and jacketing, sealers, tapes, adhesives, mastics and other accessories used in conjunction with the installation of insulation shall have a fire hazard rating of not to exceed 25 for flame spread and 50 for smoke developed. All material shall be of types approved under NFPA 90A, Underwriters' Laboratories and by F.I.A.

12. Underwriters' Laboratories, Inc., label or listing, satisfactory test results from the National Bureau of Standards, or certified test report from an approved testing laboratory shall be required to indicate that fire hazard ratings for materials proposed for use do not exceed those specified.

13. Flameproofing treatments subject to deterioration due to the effect of moisture or high humidity, are not acceptable.

14. Armaflex or similar insulating material is not acceptable.

15. Insulation Jackets and Facings

    a. All jackets and facings shall comply with the Fire Hazard Ratings.

    b. Vapor Barrier Jackets and Facings

        1) All vapor barriers shall be sealed and continuous throughout.

        2) All voids shall be filled with insulating cement prior to applying vapor barrier jackets.

B. Piping:

1. All piping herein specified shall be insulated with fiberglass insulation unless otherwise noted.

   a. Insulate all hot water piping. Fiberglass shall be 25 ASJ heavy density pipe insulation with a factory applied embossed white Kraft jacket (all service jacket) as manufactured by Owens Corning Fiberglass.

   b. Apply pipe insulation to clean, dry pipe with side and end joints butted tightly. Seal lap of jacket and butt strips with a vapor barrier adhesive. Vapor barrier adhesive shall be as recommended by adhesive manufacturer for this application and shall be compatible to vapor barrier jacket so as to form a complete vapor tight system.

   c. Fittings, valves and flanges shall be covered with premolded fiberglass fittings of a thickness equal to adjacent pipe insulation. Sections of premolded insulation shall be wired in place. Hot piping fittings shall have an 8 ounce canvas jacket embedded in a fire retardant insulation lagging adhesive Benjamin Foster 30-36.

   d. Insulation thickness for piping system shall be as follows:

		Fiberglass ASJ Pipe Insulation Thickness In Inches				
No.	Piping System Types	1" & Less	1-1/4 - 2"	2-1/2 - 4"	5" & 6"	8" & Larger
1.	Hot Water & Cold Water Make-Up Piping	1.0	1.0	1.0	1.5	1.5

   e. 3/4" pipe insulation shall be used on 2" mains as needed to fit in 3-1/2" stud walls.

   f. Refrigerant piping to be insulated as recommended by refrigeration equipment manufacturer.

C. Air Separators:

1. Air separators shall be insulated with 2" thick calcium silicate blocks wired in place.

2. All joints shall be filled with insulation cement and the entire outer surface shall be covered with a layer of 1" hexagonal mesh wire securely stapled to the insulation. Over the wire shall be applied two coats of Portland cement. The first coat shall be troweled to a smooth finish. The total thickness of the cement shall be not less than 1/2". An eight ounce canvas jacket shall be embedded in a flood coat of fire retardant insulation lagging adhesive Benjamin Foster 30-36.

2.25 PRESSURE REDUCING AND RELIEF VALVES

A. Furnish and install pressure reducing and relief valves for the various water systems as indicated on the drawings. The valves shall be as manufactured by Bell and Gossett, Taco, Watts or equal. The relief valves shall be adjustable type set for 10 psig above operating pressure.

B. All pressure reducing valves shall have a bypass through a globe valve.

2.26 HOT WATER EXPANSION TANK

A. Furnish and install expansion tanks for the hot water system as indicated on the drawings. The tanks shall be as manufactured by Bell and Gossett, Taco, Amtrol Inc. or approved equal.

B. The tank shall be of a size and capacity as indicated on the drawings.

C. The tank shall be of ASME construction.

D. The tank shall be installed in strict accordance with the manufacturer's recommendations.

2.27 HOT WATER BOILERS

A. Furnish and install the hot water boilers. The units shall be constructed, including all components and accessories, in accordance with ASME, Commonwealth of Massachusetts and the City of Boston Codes and requirements. The boilers shall be Model "MR" as manufactured by Hydrotherm Inc. or approved equal.

B. The hot water boilers shall be gas-fired, cast iron modular type. Each boiler module shall be factory-assembled with combination gas valve with intermittent pilot, transformer, atmospheric-type lanced aluminized steel burners, base, absorption unit, hi-limit aquastat, and draft hoods.

C. Each battery of modules shall be equipped with ASME pressure relief valves, temperature and pressure gauges, manual reset hi-limit and a low water cut-off. Insulated steel jackets shall be provided by the manufacturer for assembly into one complete extended jacket for each battery of modules. Each battery for modules shall be provided with supply and return header manufactured by the boiler manufacturer.

D. The cast iron absorption unit for each module shall be constructed for 100 psi working pressure in accordance with Section IV of the ASME Code for Low Pressure Boilers. Construction features shall include horizontal section design to provide zig-zag water flow with maximum heat transfer from deep-ribbed iron surfaces with cast iron push nipples. Cope seal shall be employed between section to provide a permanent gas-tight seal between sections. Sections shall be held together with draw rods. Each section shall be hydrostatically tested at 250 psi. Complete assembly shall be hydrostatically tested at 150 psi and air tested. Flue collector shall be of same quality cast iron as absorption unit. Absorption unit shall be held to cast iron side plates and lined with high-temperature mineral-fibre insulating panels by mounting clips and bands. Base assembly shall be fire-tested and dielectric tested.

E. Gas control on each module shall be factory-wired, tested and suitable for firing each module individually. Step firing of each module shall be accomplished by firing individual boilers without reducing their thermal efficiency.

F. The boiler manufacturer shall provide the services of factory trained engineers to supervise installation, start-up and adjustment of the units and operating instructions for the Owner's personnel.

G. Outdoor Reset Hot Water Temperature Controller:

1. Furnish and install an electronic boiler and system water temperature controller, electronic sequencer.

2. The boilers will be sequenced by the boiler electronic sequencer to initiate the "low fire" sequence on the lead boiler followed by a "low fire" sequence of the lag boiler. On an increased demand, the lead boiler "high fire sequence" will be initiated, followed by the "high fire" sequence of the lag boiler. On a decreased demand for heat, the reverse will occur.

3. The boiler electronic sequencer will operate the boilers by varying the hot water discharge temperature, as sensed by the remote sensor, in response to outside air temperature. Control shall be designed for use with secondary sensor in outside air to reset control point upward as the outside air temperature drops.

4. Device shall be capable of up to 8 heating stages for multiple boiler application and shall be set to maintain 200^{O}F hot water supply temperature at outside air temperature of 0^{O}F.

5. Device shall be furnished installed with a code gauge steel panel box designed for remote mounting where indicated on the contract drawings. It shall be furnished with all necessary relays, switches, contactors, primary and secondary remote sensors and shall incorporate a lead/lag selection switch for manual selection of the lead boiler.

6. Refer to Sequence of Control under ATC Section of the Specifications.

2.28 BREECHINGS

A. Furnish and install the breechings or flues of the sizes and shapes as indicated on the drawings and as specified herein.

B. The breachings shall be modular prefabricated piping systems that embody flanged joints designed for quick assembly and pressure sealing capability.

C. The expansion joints shall be pressure tight all welded design.

D. The stack shall utilize a high strength load bearing inner pipe with flanged ends. The joints shall be made with bands which shall be sealed during installation to prevent gas leakage.

E. The outer casing shall function as a jacket to maintain a one inch insulating air space and to protect the inner pipe from internal condensation and mechanical damage.

F. Factory supplied parts shall allow the system to be resupported, if need be, with compensation for expansion and contraction to any required height.

G. The inner gas carrying pipe shall be Type 316 stainless steel with a minimum thickness of 0.035 inches for all sizes. The outer jacket of aluminized steel shall retain its low radiant emissivity up to 900 degrees F actual surface temperature. The outer jacket shall surround a one inch insulating air space and shall protect the inner joints and pipe from damage. The minimum material thickness for outer jackets shall be 0.025 inches for 10 inch through 24 inch sizes.

H. Concentricity of individual pipe section construction shall be obtained by multiple tab spacer bands attached to the outer jacket at each end and retained behind the inner flanges. Side loads shall be transferred through the spacer band tabs to the inner pipe. For long service life and minimum heat conduction, the inner Vee Bands shall be of Type 316 stainless steel.

I. The stacks shall be listed by Underwriters' Laboratories, Inc. and shall carry the UL listing mark.

J. The joints shall be properly sealed and each stack system shall be installed in accordance with the manufacturer's recommendations.

K. The flues shall be Model PS as manufactured by Metalbestos or approved equal for natural gas firing.

2.29 STRUCTURE PENETRATIONS

A. Provide sleeves around pipes, ducts, conduits, etc. whenever they penetrate the structure. The space between the penetrating member (insulated or uninsulated) and the sleeve shall be tightly packed with fibrous material the full depth of the penetration and sealed both sides with a non-hardening resilient sealer. The space around the insulated or uninsulated members should be limited to between 1/2 and 1 inch. Should spaces be left outside the sleeve and the building structure shall be closed in to satisfy the limits described above with materials providing at least the same surface weight as the structure being penetrated.

B. Filler material within the sleeve shall be inorganic mineral or glass fiber. Combustion rating of the filler material shall be not less than the following when tested in accordance with ASTM E84, NFPA Standard 255 or UL No. 723:

Flame Spread Rating = 25
Smoke Development Rating = 0
Fuel Contribution Rating = 20

C. Acoustical sealent for concealed application shall be non-shrinking, non-migrating, non-straining sealant of either non-drying or permanently elastic type, Tremco Acoustical Sealant.

D. Acoustic sealant for exposed application shall be permanently elastic paintable acoustical sealant, either latex, acrylic, or acrylic-latex type, Pecora AC-2.

2.30 VIBRATION ISOLATION

A. Furnish and install vibration isolation equipment to prevent transmission of vibration from all mechanical equipment to the building structure. Unless otherwise specified, all vibration isolation equipment shall be furnished by a single manufacturer and shall be as manufactured by Korfund Dynamics Corporation, Vibration Eliminator Company, Mason Industries or approved equal.

B. The isolation manufacturer shall supply all unit isolators, complete rails, fan and motor bases and structural steel forms for concrete inertia blocks, where called for. Wherever rotational speed is mentioned as the disturbing frequency, the lowest such speed in the system shall be used. All isolation devices shall be selected for uniform static deflections according to distribution of weight.

C. All wiring and other connections to the vibration isolated units shall be made flexible with a minimum 180 degree loop of greenfield in order to avoid restraining the equipment and short circuiting the vibration isolation.

D. Submittal data for isolation equipment shall include detailed calculations showing weight distribution, type, load and deflection of each isolator. Manufacturers' recommendations must be followed.

E. Unless otherwise indicated, all equipment mounted on vibration isolator bases shall have a minimum operating clearance of one inch between the base and the housekeeping pad beneath. Clearance space shall be checked to insure that no scrap, rubbish, hardware has been left to possibly short circuit isolated base.

F. Equipment connected to water piping should be erected on isolators or isolated foundations to correct operating height prior to making piping connections to avoid misalignment problems. To facilitate this, equipment should be locked-up with temporary shims to final operating height. When full load is assembled and water is in system, isolators can be adjusted to take up load just enough to allow removal of shims.

G. Air handling equipment should be erected on isolators and leveled with fan operating before flexible duct connection is made. Insure that ducting position is in proper alignment and providing proper clearance in proportion to flexible duct connector length.

H. Horizontal Pipe Runs Within Mechanical Room:

1. All horizonal pipe runs within mechanical rooms area shall be isolated from building structure by means of units designed for insertion in rods.

2. Water lines shall be supported by combination rubber-in-shear and spring hangers. The first three hangers nearest equipment connections shall be of the "load transfer" type.

3. All isolators on piping shall be adjusted after the systems have been filled with water.

I. Centrifugal fans shall be isolated with rubber-in-shear or spring unit isolators, designed for the required deflections or efficiencies; furnish and install all necessary rails or bases as required; deflection for all tubular centrifugal fans shall be 1-1/2 inch. Ventilating units shall be isolated to meet the following requirements.

Up to 450 RPM	75% efficiency (3-1/2 max. defl.)
540 RPM to 850 RPM	90%
850 RPM and over	95%

1. Submittals shall show disturbing frequency, required efficiency, design deflection and outside diameter of springs, when pertinent.

J. Isolators:

1. Single rubber-in-shear shall be a molded shaped element designed for 1/2" deflection under the imposed static load. Double rubber-in-shear shall be two elements as described above, assembled in series to provide 1/2" deflection under the imposed static load. Rubber-in-shear isolators shall be properly housed and provided with adequate facilities for bolting.

PART 3 - EXECUTION

3.01 IDENTIFICATION

A. General:

1. All equipment, piping and ductwork, furnished under this Section of the Specification shall be marked for ease of identification as indicated below.

2. Marking shall be done using self-adhering labels applied to clean, smooth surfaces. Where standard stickers designations are not available, stenciling shall be used. All lettering shall be not less than 3 inches in height with sharply contrasted background for ease of identification. Colors shall be in accordance with ANSI standards. Samples of stickers together with color schedules shall be submitted for approval.

B. Equipment:

1. Equipment marking shall be prominently located on normally visible side of equipment. Equipment intended for installation in finished areas shall have markings located behind normally used access panels mounted so as to be readily found.

2. Equipment identification designations shall be taken from equipment schedules as indicated on the drawings.

C. Piping:

1. Piping marking shall be prominently mounted on all piping exposed to view. Marking spacing shall be every 20 feet and at all changes in direction.

2. Piping markers shall indicate the direction of flow with the piping designation taken from the piping legend indicated on the drawings.

D. Valve Tags and Valve Chart:

1. All valves of all description on all piping are to have valve tags attached with brass clips hook or chain to stem or handle of valve and be readily accessible through access panel or door. They shall be in vicinity of identifying marker noted above.

2. Valve tags are to be circular anodized aluminum, color coded type, with color anodized into metal. Tags to be two (2) inches in diameter with numbers not less than 1/2 inch high. Each tag to also bear identifying mark or legend of service not less than 1/4 inch high. All number and identifying service marks are to be heavily engraved on tags.

3. Color coding of tags to match plastic sleeve identifying markers noted above.

4. To match item as made by Seton Nameplate Corp., New Haven, Conn. 06505

5. All numbers of all valves are to be indicated on the record drawings both in plan and riser diagram.

6. All numbers of all valves along with their location and other pertinent data relative to the requiring of opening or closing another valve when any one valve is opened or closed, shall be incorporated into a valve chart or list. This list shall be typewritten in a approved form and submitted with record drawings and maintenance manuals.

E. Motor Control Identification:

1. All electric motors furnished and installed under this Section shall have permanently applied nameplates fabricated of black enameled aluminum with engraved lettering. Size of nameplate shall be a minimum of 2-1/2 inches long by 3/4 inches high as manufactured by Seton Nameplate Co., New Haven, Conn.

2. All nameplates to bear notations or marks that correspond with data in Operating and Maintenance Manuals.

F. Schedule and Charts:

1. Valve schedules and charts shall be prepared showing tag numbers, valve locations and valve service. Valve tag numbers shall be marked upon the record and/or coordination drawings and valve schedules shall be submitted with the record drawings. Two sets of valve schedules shall be framed under glass and mounted where directed by the Owner. Two sets of valve schedules shall be laminated between mylar sheets and turned over to the Owner. Valve lists shall have valve identification number, and valve location.

3.02 CLEANING

A. Cleaning:

1. Upon completion of all piping and sheetmetal work in any area all work specified under this section is to be cleaned and where required, polished and made ready for use. Clean and remove all debris, clean out all piping systems and flush with water. All fixtures are to be cleaned, all trim installed, all protective oil tape or other materials used to protect work are to be removed. Clean out all floor roof area drains, etc. of all construction material. All strainer and steam trap interiors shall be removed, cleaned and replaced. All dirt pockets shall be drained and cleaned. Flushing shall be supervised by chemical treatment specialits.

2. All ducts and air handling units shall be thoroughly cleaned inside and outside and blown out to prevent any debris from damaging fan wheels or debris hanging through registers or diffusers when systems are placed in operation. All temporary connections required for blowing out the systems, cheesecloth for all duct openings, and any other equipment or labor for cleaning, shall be provided by this Contractor. All filters shall be renewed after air handling systems have been cleaned. The entire HVAC system shall be kept clean until final acceptance. Any damage to ceilings by this Contractor or his agents shall be rectified by him at no additional charge to the Owner.

3.03 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Prior to completion of the Contract, provide field and written operating instructions to the Owner's designated representative with respect to operation functions and maintenance procedures for all equipment and systems installed.

B. All operating equipment installed under this Section shall be placed in operation and shall function continuously in an operating test for a period of two weeks, without shutdown due to mechanical failure or necessity of adjustment. Prior to scheduling the project Final Inspection and after completion of all installation and running equipment and automatic control adjustments, perform air and water balancing and any other work required to place the equipment in complete operating condition to meet all requirements under this specification. During this running test period, deliver to the Owner two complete sets of operating, service, maintenance and replacement data for all equipment which will require operating maintenance or replacement and one copy of this literature shall be available during the instruction of the operating personnel while the other is checked for completeness. The instructions shall be in two sets, each permanently bound in hard cover. Flysheets shall be placed before instructions covering each section. The instruction sheets shall be 8-1/2 inch by 11 inches with large sheets of drawings folded in. During all working hours of the "two week operating test" this Contractor's instruction personnel shall be available for giving field instructions to the Owner's Operating and Maintenance Personnel. This field instruction shall cover operation, maintenance and adjustment of all equipment installed, to the complete satisfaction of the Owner.

C. Sufficient notice shall be given to the designated operating personnel of the Owner in advance of this period. Upon completion of instruction, obtain from such representative(s) written verification that the above mentioned instruction has been performed. Such verification shall be forwarded to the Engineer.

D. Operating Manual: Upon completing the work, provide the Owner with six copies of the approved operating manual containing approved shop drawings, equipment literature, cuts, bulletins, performance charts, and details, equipment and engineering data sheets and typewritten instructions relative to the care and operation of the equipment, all properly indexed and bound in two hard back three ring binders. The manual shall have the following minimum contents.

TABLE OF CONTENTS

1. Introduction
   a. Explanation of manual and its purpose and use.
   b. Description of all HVAC systems.
   c. Description of motor controls.
   d. Description of temperature control function and sequence for start-up, operation and shut down.
   e. Description of hot water system.
   f. Safety precautions necessary for all equipment.
   g. Illustrations, schematics, block diagrams.
   h. Wiring diagrams.
   i. Installation drawings.
2. Maintenance
   a. Maintenance and Lubricating Instructions.
   b. Replacement Charts.
   c. Preventive Maintenance Recommendations.
   d. Trouble Shooting Charts for Equipment Components and HVAC Systems.
   e. Testing Instructions for each Typical Parts or Components.
   f. Equipment Calibration Instructions.
   g. Systems Draining, Filling and Purging Instructions.
   h. Chemical Treatment Instructions.
   i. Two typed sets of charts indicating equipment tag number, location of equipment, specific equipment service, greasing and lubricating requirements as recommended, lubricant type and intervals of lubrication. Two complete charges of lubricating oil necessary for all equipment shall be furnished.

j. Two typed sets of instructions for ordering spare parts. Each sets shall include name, price, telephone number and address of where they may be obtained.

3. Manufactuer's Literature

   a. Pumps, boiler and air handling equipment.

   b. Fans.

   c. Motors.

   d. Motor Controls.

   e. Automatic Temperature Controls.

   f. All equipment for which shop drawings have been submitted and approved.

3.04 SPECIAL TOOLS

A. Provide any and all special tools recommended by the manufacturer of items furnished, noted as not being commonly available.

3.05 EQUIPMENT PERFORMANCE TESTS

A. After the systems have been completed and before any HVAC system is accepted, test to demonstrate the capacity of the equipment specified to achieve design inside conditions during design outside summer and winter conditions. This Contractor shall retain the services of all his agents at no additional charge to the Owner until design outside conditions are available for conducting this test. Demonstrate adequate general operating characteristics of all equipment during the equipment performance test to the Owner or his representative, through a competent professional experienced engineer who will attest the reliability of results. The performance tests shall cover a period of not less than 2 days for each system and shall demonstrate that the entire system is functioning in accordance with the drawings and specifications. Corrections, repairs, replacements and adjustments for deficiencies found in the plant as a whole or any of its components during test, shall be made good as necessary to produce specified conditions. This Contractor shall assume full responsibility for satisfactory operation of all parts of the integrated system during test. Typed tabulated data taken during the performance tests that will indicate that the systems produced the required capacity shall be provided. Performance tests shall include the following specific information in the report with conclusions regarding the adequacy of the system.

1. Time, dates and duration of test.

2. Inside dry bulb and wet bulb temperature maintained in each room or space used for and served during the test, employing instruments properly calibrated before the test.

3. Outside dry bulb and wet bulb conditions obtained hourly from instruments properly calibrated and checked with a sling psychrometer.

4. Electrical input and voltmeter and ammeter readings for all electrical motors when operating fully loaded, to insure that nameplate ratings are not exceeded. Furnish all instruments, test equipment, and test personnel required for the tests at no additional charge to the Owner. The report of test shall be submitted in duplicate.

3.06 CERTIFICATES OF APPROVAL

A. Upon completion of all work, furnish to the Owner, in duplicate, certificates of inspection and/or approval from state and local inspection authorities having jurisdiction indicating the installed HVAC system's compliance to their requirements.

B. Furnish to the Owner, in duplicate, notarized letters from the manufacturers of other agencies of the following systems stating that authorized factory engineers have inspected and tested the installation of their respective systems and found them to be in perfect operating condition. All discrepancies and defective materials shall be rectified and replaced before the above requested letters are notarized.

1. Hot water system.

2. All air handling systems.

3. Automatic temperature control.

3.07 TESTING, BALANCING AND ADJUSTING

A. Testing, balancing, and adjusting work shall be performed by firms certified by Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) or by firms qualifying in compliance with subparagraph: Performance. Before any water is introduced into the piping system for any reasons including cleaning and adjusting, flushing, testing and balancing, the water shall be treated and the water quality shall be certified to be non-corrosive by a specialty subcontractor specializing in water treatment as specified in paragraph: CLEANING AND WATER TREATMENT in Part 3 of this section of the specifications. Any material, equipment, instruments, and personnel required for the testing, balancing and adjusting shall be provided by the Contractor.

B. Performance of this work by firms specializing in the testing, balancing and adjusting of heating, ventilating and air conditioning system will be acceptable provided the testing firms shall have submitted adequate documentation to the Owner as to their competence. The testing firm shall have on its staff a registered professional engineer who shall be responsible for the accuracy of the balancing procedure and test data. All testing and balancing procedures shall be in accordance with the standards of AABC or NEBB and procedures shall be approved by the Engineer prior to testing and balancing. The firm shall provide proof of having successfully completed a minimum of five projects of similar size and scope.

C. Prior to testing and balancing, air shall be removed from all water systems by operating the air vents. Temporary measures, such as piping the overflow from vents to a collecting vessel shall be taken to avoid water damage during the venting process. All air vents shall be plugged or capped after the system has been vented. Temporary filters shall be provided for all fans that are operated during construction, and new filters shall be installed after all construction dirt has been removed from the building, and the ducts, plenum and casings, and other items specified hereinbefore, have been vacuum cleaned. Bearings shall be properly lubricated with oil or grease as recommended by the manufacturer. Belts shall be tightened to proper tension. Control valves and other miscellaneous equipment requiring adjustment shall be adjusted to setting indicated or directed. Fans shall be adjusted to the speed indicated by the manufacturer to meet specified conditions.

   1. Refer to ATC paragraph for coordination with the ATC Contractor during balancing and adjustments.

D. Testing: The Contractor shall submit his proposed testing program to the Engineer at least two weeks prior to the scheduled test to assure agreement as to the personnel and instrumentation required and the scope of the testing program. All tests shall be conducted in the presence of the Engineer or Engineer's representative who shall be given two days notice before any test is to be conducted. Water and electricity required for the tests will be furnished by the Contractor.

   1. Water Piping: After cleaning, all water piping shall be hydrostatically tested at a pressure equal to 150 percent of the total system operating pressure for a period of time sufficient to inspect every joint in the system and in no case less than 4 hours. Shut-off valves serving autoamtic air vents shall be in the closed position during hydrostatic testing. No loss of pressure will be allowed. Leaks found during tests shall be repaired by rewelding or replacing pipe or fittings. Concealed and insulated piping shall be tested in place before covering or concealing. All equipment which may be damaged during testing shall be disconnected.

   2. Low Pressure Ductwork: Even though the duct construction is for low velocity system, the joints shall be sealed for "Class A" classification. The duct system shall therefore be tested for air leakage up to 1-1/2 times the external static pressure, using procedures similar to high velocity systems. Notification shall be given as to the time of testing for witnessing.

a. Test Apparatus

1) The Sheet Metal Contractor shall furnish a source of high pressure air and flow measuring device for the testing of duct systems for leakage.

b. Test Procedure

1) Close off and seal off openings in the duct section to be tested. Connect the test apparatus to the duct by means of a section of flexible duct.

2) Start the blower with its control damper closed.

3) Gradually change the motor speed until the duct pressure reaches 1-1/2 times the external static pressure.

4) Hold this pressure for ten minutes. This brief overloading should reveal marginally constructed joints.

5) Reduce the pressure in the duct to maximum design pressure or 2.0 inches w.g. whichever is greater, and survey all joints for audible leaks. Mark each leak and repair after shutting down the blower or source of air. Do not apply a retest until sealants have set.

6) After all audible leaks have been sealed, the remaining leakage shall be measured with the orifice section of the apparatus as follows:

a) Start blower and open damper until pressure in duct reaches design pressure or 2 inches w.g. whichever is greater.

b) The total allowable leakage for the entire system should be no more than one percent of the total system capacity.

c) If the measured leakage exceeds five percent after all audible leaks have been corrected, the leaks shall be located by more careful listening or by feeling along the joint.

d) Even through a system may pass the measured leakage test a concentration of leakage at one point may still result in a noisy leak and shall be corrected in any case.

E. Balancing:

1. Water System Procedures

   a. Adjustment: The hot water system shall be adjusted to provide required quantity to or through each component.

   b. Metering: Water quantities and pressure shall be measured with calibrated meters.

   c. Venturi tubes, orifices, or other metering fittings and pressure gages shall be used to measure water flow rates and balance systems.

   d. Systems shall be adjusted to provide the approved pressure drops through heat transfer equipment, including coils, prior to the capacity testing.

   e. Where flow metering fittings are not installed, flow balance shall be determined by measuring temperature differential across heat transfer equipment.

   f. Measurement of temperature differential shall be performed with the air system, adjusted as described herein, in operation.

   g. Automatic control valves shall be positioned for full flow through the heat transfer equipment of the system during the tests.

   h. Distribution: Adjustment of distribution shall be effected by means of balancing devices including cocks, valves, and fittings and automatic control valves as provided; service valves shall not be used.

   i. Where automatic flow control valves are utilized in lieu of Venturi tubes, only pressure differential need be recorded, provided that the pressure is at least the minimum applicable to the tag rating.

   j. Special procedures: Where necessary and after approval of the Engineer, full flow may be simulated by the temporary restriction of flow to portions of the system; specific procedures shall be delineated in the test reports.

2. Duct systems shall be balanced to produce air quantities within 5 percent plus or minus of that indicated. Individual air outlets shall be balanced within 10 percent plus or minus of the air quantities indicated on the drawings.

F. Performance Tests: After cleaning, balancing, and testing are completed as hereinbefore specified, each system shall be tested as a whole to see that all items perform as integral parts of the system and temperatures and conditions are evenly controlled throughout the building. Corrections and adjustments shall be made as necessary to produce the conditions indicated or specified. The capacity tests and general operating tests shall be conducted by a competent experienced engineer. The tests shall cover a period of not less than 7 days for each system and shall demonstrate that the entire system is functioning in accordance with the specifications.

G. Test Data:

1. General: The Contractor shall provide the Engineer with typewritten schedules of readings taken during the balancing and testing operations indicating the required or specified reading, the first reading taken, and final balanced reading for the following items:

    a. Fans: Size, type, speed in RPM, outlet velocity in FPM, static pressure in inches of water, air quantity in CFM, and motor load in amperes and input voltage.

    b. Air balance

        1) Air outlets and inlets: Size, velocity in FPM and air quantities in CFM.

        2) Coils: Size, face velocity in FPM; air temperature entering coil and air temperature leaving coil, wet bulb and dry bulb degrees F; water temperature entering coil and water temperature leaving coil, degrees F.

        3) Ducts: Size, velocity in FPM, and air quantity in CFM.

    c. Pumps: Inlet and outlet pressures, water quantity in GPM and motor load in amperes and input voltage.

    d. Control settings: On site settings for all automatic controls including thermostats, safety controls, minimum damper settings, fire safety thermostats, pressure controls, temperature controls, and other similar items shall be provided by the Contractor. The Contractor shall provide the Engineer with four copies of final test reports. Report shall be on recognized forms similar to those of AABC or NEBB.

3.08 CLEANING AND WATER TREATMENT

A. General:

1. After completion of installation, all piping shall be flushed out and left completely free from oil, dirt, and welding shot. All strainer interiors and steam traps shall be removed, thoroughly cleaned and replaced. All dirt pockets shall be

drained and cleaned. The flushing out and treatment shall be done under the supervision of Betz Laboratories, Water Treatment Corporation of America, Barclay Chemical Co. or approved equal.

2. Furnish complete water treatment equipment, piping, chemicals and service to clean and treat the various piping systems as specified herein in a manner which prevent corrosion, scale, slime and algae growth. Equipment, chemicals and service shall be provided by one of the above Water Treatment specialists or approved equal. The approved Water Treatment Specialists shall supervise the installation of the chemical feed equipment and the chemical cleaning and treatment.

B. Service Contract:

1. A contract satisfactory in form and substance shall be executed between this Contractor and one of the above Water Treatment Specialists or approved equal, through its authorized agents, binding the Water Treatment Specialist to furnish supervisory service to assure the proper cleaning and treatment of the piping systems herein described during the life of the service contract. The service contract shall begin at the time of initial fill of the piping systems herein described for any reason, including testing, and shall terminate with the final acceptance of these systems by the Owner.

2. The Water Treatment Specialist shall perform the following functions through its agents:

   a. Supervise the initial fill and flushing out of all piping systems to be treated. The flushing out shall be done in accordance with the procedure hereinafter described.

   b. Supervise the installation and introduction of all chemical analyzing and feed equipment.

   c. Supervise the initial introduction of water treatment chemicals into the systems and the start-up of chemical treatment equipment.

   d. Instruct the Owner's operating personnel in the operation of the chemical treating equipment, performance of the control tests and their interpretation.

   e. Provide service calls by its agents as required to insure the proper and continuous treatment of the piping system from the time of initial fill to final acceptance by the Owner. In no case shall the frequency of the service calls be less than once per thirty days.

   f. Furnish all required chemicals for the proper cleaning and treatment of all piping systems together with all testing equipment and reagents for field analysis of the water during the life of the contract.

3. It shall be the responsibility of this Contractor to keep the Water Treatment Specialist fully informed as to the progress of the work so that the piping systems can be cleaned and treated as described herein. This Contractor shall provide the services of his personnel to assist and work under the supervision of the Water Treatment Specialist in the cleaning and treating of the systems as described herein.

4. Before actual execution of the contract, a copy of the contract shall be submitted for approval.

5. All service calls shall be confirmed in writing to the Owner so that a complete record of service activities is available for examination by the Owner.

C. Chemical Treatment:

1. Hot Water System

a. A five gallon bypass type shot feeder complete with valves, funnel and relief valve shall be installed around the circulating pumps.

b. The water systems shall be treated with the proper chemicals to protect against corrosion. Chemicals for this system shall not contain materials which shall harm seals or other parts of the system.

D. Cleaning and Flushing:

1. The following procedure shall be considered as minimum preparation for each system and shall be accomplished sequentially as erection progresses and in such a manner as to prevent contamination of any previously prepared section of piping.

2. At the time of initial fill for each system or part thereof, there shall be added not less than 50 pounds per 1000 gallons of contained water, a powder blend of an alkaline detergent comprised of the following ingredients:

Soda Ash	40%
Sodium Silicate Pentshydrate	35%
Sodium Tro-polyphospate	24%
Wetting Agent, Non-ionic	1%
	100%

3. Water containing this detergent shall be circulated for not less than 6 hours at a velocity of not less than 1 foot per second, after which the system shall be rapidly emptied with circulating pumps operating and, wherever possible, simultane-

ously adding or chasing with rinse water. In any case, the systems shall be flushed until neutral to phenolphatalem. After flushing, all strainers shall be removed and cleaned.

4. As soon as possible after completion of the flushing, and with clean water in the systems, the systems shall be treated with chemicals as described herein.

5. When any piping system is disturbed after it has been cleaned and treated, this Contractor shall immediately notify the Water Treatment Specialist, who will supervise recleaning and/or retreatment as required to comply with the intent of this paragraph, "CLEANING AND WATER TREATMENT".

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PART 1 - GENERAL

1.01 REFERENCE

A. The GENERAL DOCUMENTS, as listed on the Table of contents, and applicable parts of Division 1, GENERAL REQUIREMENTS, shall be included in and made part of this Section.

B. Coordinate work with that of other Sections affecting or affected by work of this Section and cooperate with such Contractors to assure the steady progress of the Work.

C. Review all drawings and all Sections of the Specifications for provisions therein affecting the work of this Section.

D. Unless otherwise indicated, the reference made in this Specification to "the building" shall denote each building of the project.

1.02 SCOPE

A. The scope of work under this Section, without limiting the generality thereof, includes the furnishing of all labor, materials, equipment, services, and incidentals necessary to complete all ELECTRICAL work in accordance with the intent of the Specifications and the Drawings.

B. The work shall consist of but not necessarily be limited to the following.

1. Incoming underground ductbank system originating 2'-0" inside the property line and terminating at the services end box and main services in the two buildings (Parcel 20A and Parcel SE70-TA). Said serviceS ARE delivered by and shall be coordinated with the Boston Edison Company.

2. Incoming ductbank system for telephone and cable television services to the TWO buildingS (Parcel 20A and Parcel Se70-T1) from a point 2'-0" inside the property line.

3. The two buildings fire alarm systems including interface with the City of Boston Municipal System.

4. Secondary distribution (208Y/120 volt, 3-phase, 4-wire) system throughout the building, for house (common areas) loads, from the distribution panelboard to building service equipment and to panelboards for branch circuits requirements, including connections, cables, raceway systems, wireways, disconnect switches, panelboards, and appurtenances required for a complete system.

5. Secondary distribution (120/208 volt, single-phase, 3-wire) system throughout the building, for dwelling unit services, from the meterbank to each dwelling unit loadcenter.

6. Lighting system including lighting fixtures, panelboards, raceways, wiring, lamps, switches, time clocks, photo-cell controls, switches and appurentances required for a complete system.

7. Temporary lighting and power system shall be provided in conformance with the requirements of Division 1.

8. Motor starters, contactors, disconnect switches and line voltage (120V and higher) control devices including hand-off automatic switches, selector switches, pilot lights and push button stations not furnished as an integral part of Heating, Ventilating, Air Conditioning, Plumbing and other equipment in general required for the operation of the building facilities.

9. Power supply for the elevator including a fused disconnect switch in the elevator machine room, branch feeder wiring, receptacle and switched light in the elevator pit, elevator machine room lighting and power, and telephone power requirements for the elevator cab via half-way boxes.

10. Grounding systems including grounding and bonding of electrical systems and equipment.

11. Raceways systems for the telephone and cable television systems including pull boxes, raceway system and terminal backboards.

12. Telephone and cable television systems cabling from the outlets in the dwelling units to the terminal backboards in the electrical equipment room including cable, outlets, TV splitters, and cable tagging.

13. Sleeves, inserts and supports to be cast or set in place, all core drilling for the passage or support of electrical materials, equipment, and systems.

14. Sealing of raceway systems to prevent the entrance of water into the building, raceway or equipment.

15. Sealing of raceway system sleeves for fireproofing requirements.

16. Access panels required for access to concealed electrical items requiring access.

17. Submittal of list of materials and shop drawings in conformance with the requirements of Division 1.

18. Testing required by the intent of this specification with typewritten data sheets.

19. Interlock wiring indicated on the drawings or hereinafter specified that is required for the operation of mechanical

equipment furnished and installed under the HVAC and Plumbing Sections of the Specifications. Automatic temperature control wiring is not considered a part of interlock wiring and will be provided under Section 15400.

20. The building's fire alarm system including actuating signal devices from the sprinkler and HVAC systems. The system shall be interfaced with the local fire department via the City of Boston connected master box.

21. Building apartment intercom system and dwelling unit signaling system.

22. Coordination with the utility companies and municipal agencies for the incoming electrical, telephone and cable television services. Carry all utility company and municipal agency backcharges as part of this bid proposal.

23. Other electrical systems and equipment required by the Contract Documents for the proper function of the building not specifically indicated above, but referenced or shown on the drawings or referenced under other Sections of the Specifications.

C. Related work by others and included under other Sections of the Specifications:

1. Excavation and backfill -- EARTHWORK.

2. Concrete work -- CAST IN PLACE CONCRETE.

3. Cutting and patching -- UNIT MASONRY.

4. Painting of all equipment and material other than fixtures, distribution board, panelboards, loadcenters, meterbanks and other electrical components that are factory finished -- PAINTING.

5. Elevators furnished under CONVEYING SYSTEMS.

6. Furnishing and setting in place of plumbing equipment motors and equipment -- Section 15400 - PLUMBING & FIRE PROTECTION.

7. Furnishing and setting in place of HVAC motors and equipment -- Section 15500, HVAC.

8. Automatic temperature control system -- Section 15500, HVAC.

1.03 DRAWINGS AND SPECIFICATIONS

A. The drawings are, diagrammatic and are intended to convey the scope of work; indicate the general arrangement of equipment, conduit and the like; and show the approximate sizes of equipment. The drawings shall be followed as closely as practical in laying out work and verify all spaces in which the work under this Section is to be installed.

B. It is the intent of the contract documents to provide complete operating systems. Omission from the specifications or drawings of any details of construction, installation, materials or specialists necessary for a safely operable system shall not relieve this Contractor of furnishing and installing the materials, fittings or accessories required for the furnishing and installation of complete and operational systems.

C. Modifications of catalog cuts that may be required in the event of conflicts between the performance and description of equipment or material and the implication of manufacturer's catalog number, the performance and description shall govern.

D. Discrepancies between the drawings and specifications shall be referred to the Architect for interpretation before proceeding with the work. If this Contractor proceeds with the work without referring discrepancies to the Architect for interpretation, he shall do so at his own risk and make all changes to meet the Architect's interpretation of the bid documents without requesting additional compensation.

1.04 CODES, ORDINANCES AND REGULATIONS

A. The installation shall comply with the regulations of the National Electrical Code, State of Massachusetts Electrical Code, City of Boston Building Department, National Electrical Safety Code, the requirements of the City of Boston Fire Department and Wire Inspector, and all legally constituted authorities having jurisdiction. Where the drawings and/or specification requirements exceed the requirements of the applicable codes the requirements specified in the contract documents shall take precedence.

B. Materials furnished and all work installed shall comply with the rules and recommendations of the National Fire Protection Association, the National Electrical Code, with all requirements of all city or state agencies having jurisdiction.

1.05 STANDARDS

A. Materials and equipment shall be new and comply with the applicable standards of the following authorities, except where the contract documents prescribe more rigorous qualifications, the documents shall govern:

1. Underwriters' Laboratories, Inc. (UL)
2. National Electrical Manufacturer's Association (NEMA)
3. Institute of Electric and Electronic Engineers (IEEE)
4. American Society for Testing Materials (ASTM)
5. American National Standards Institute (ANSI)

6. National Fire Protection Association (NFPA)
7. Insulated Power Cable Engineers Association (IPCEA)
8. Occupational Safety and Health Administration (OSHA)
9. Boston Edison Company
10. New England Telephone Company

B. Materials and equipment shall be listed by the various testing agencies listed above and shall bear the labels of the applicable agencies.

1.06 EXAMINATION OF SITE

A. The submission of a proposal shall be construed as evidence that this Contractor has visited the site and has made a thorough examination of the existing conditions. Claims for labor, equipment or materials required for difficulties encountered, due to the omission of said site visit, shall be bourne by the Bidder.

1.07 SURVEYS AND MEASUREMENTS

A. Horizontal and vertical measurements shall be taken from reference points established by the Architect. Drawings shall not be scaled.

B. In the event of discrepancy between actual measurements and those indicated, notify the Architect in writing and do not proceed with work until written instructions have been issued by the Architect.

1.08 SHOP DRAWINGS

A. Shop Drawings shall be submitted in accordance with the requirements of Division 1.

B. List of shop drawings required:

1. Distribution panelboards, panelboards, loadcenters, meterbanks and associated components.

2. Motor starters, contactors and control devices.

3. Disconnect switches and fuses.

4. Lighting fixtures and emergency battery units.

5. Wiring devices and plates.

6. Fire alarm system.

7. Raceways and fittings.

8. Wire and cables (all systems and voltages).

9. Photo electric controls and time clocks.

10. Device plates.

11. Items not specifically listed above that may be requested by the Architect prior to the formal submission of shop drawings.

1.09 PERMITS AND FEES

A. Give all notices, file all plans and obtain all necessary approvals from authorities having jurisdiction required for the electrical work and for the use of same by the Architect at the completion of construction. All certificates of inspection, test results and approvals shall be turned over to the Owner and Architect prior to the final acceptance of the building by the Architect.

B. Secure and pay for all required permits, inspections and licenses necessary for, and incidental to the installation of the electrical work and the use of such work when completed.

C. Pay all costs incurred for tests to be performed in conjunction with the contract that are necesary for, and incidental to the electrical work when completed as defined in other paragraphs of this Section.

1.10 SUBSTITUTIONS

A. Where equipment is identified by manufacturer and catalog number, it shall be construed as the base or requirements for quality and performance. Where manufacturers for equipment are identified by name, the Contractor may submit for approval similar equipment of other manufacturers as substitution, provided he complies with the requirements of Division 1. The Architect's decision as to whether the submitted equipment is acceptable shall be final and binding.

B. Changes necessary to accommodate the substituted equipment shall be made at this Contractor's expense, and shall be as approved by the Architect. Detailed drawings indicating the required changes shall be submitted for approval at the time the substitution is requested.

C. If substitutions are made in lieu of specified lighting fixtures, the form, dimension, design, photometrics and profile of the specified fixture shall be followed.

1.11 SAMPLES

A. Submit samples as requested by the Architect for his approval in accordance with the provisions of Division 1.

B. Submit to the Architect color selection brochures of colors and finishes, where such choices are available from the factory, for the various materials and equipment to be installed under this Contract.

C. Deliver actual samples of fixtures (wired with cord and cap), nameplates, receptacles, switches, other small devices and parts when and as directed by the Architect.

1.12 EQUIPMENT UTILIZATION VOLTAGES

A. Motors 1/2 HP and larger -- 208 volts, 3-phase.

B. Motors less than 1/2 HP -- 120 volts, single-phase.

C. Control voltage for motorized equipment -- 120 volts.

D. Motors NEMA ratings shall be compatible with the utilization voltages listed.

E. Incandescent and fluorescent lighting, receptacles -- 120 volts.

F. Dwelling unit equipment; ranges -- 208 volts, single-phase.

G. Service to house panelboards in the building -- 120/208 volts, 3-phase, 4-wire.

H. Service to dwelling unit loadcenters -- 120/208 volts, singe phase, 3-wire.

1.13 MOUNTING HEIGHTS

A. Electrical equipment shall be mounted at the following heights unless otherwise noted or detailed on the electrical or architectural drawings. Notes on architectural drawings shall supersede those noted on or detailed on the electrical drawings. If the mounting height of any electrical component is questionable, obtain clarification from the Architect before installation.

1. Wall mounted duplex convenience outlets cable television outlets and telephone outlets -- 12 inches above finished floor to centerline unless noted otherwise.

2. Light switches, pushbutton stations, HOA switches, selector switches, and all other toggle or control switches for the operation of heating, ventilating and air conditioning, plumbing, and general building service equipment -- 4 feet above finished floor to centerline.

3. Panelboards and loadcenters for lighting, power, and other auxiliary systems -- 6 feet 6 inches to top of panel above finished floor.

4. Equipment located in all lobbies shall be as detailed on the architectural drawings or as directed by the Architect.

5. Wall brackets shall be as detailed on the architectural drawings or as directed by the Architect.

6. Fire alarm pull stations -- 4 feet above finished floor to centerline.

7. Fire alarm horn and flashing light assembly -- 7 feet 6 inches above finished floor to centerline.

8. Disconnect switches, service switches and individually mounted starters and contactors for the control, operation or isolation of motorized equipment, and electric heating units -- 5 feet minimum to centerline above the finished floor unless otherwise on the drawings or as required to suit field installation conditions and with the permission of the Architect.

1.14 TOOLS AND EQUIPMENT

A. Necessary tools and equipment such as conduit bending machines, staging for erection of conduit, light fixtures, etc. shall be furnished at the jobsite by this Contractor for fabrication and erecting all related equipment covered by this Section.

B. This Contractor shall retain in his possession, and shall be responsible for, all portable or detachable parts and portions of the installation, including keys, locks, adapters, inserts, instructions, drawings and all other devices or materials that are relative to, and necessary for the proper operation and maintenance of all systems until final completion of his work.

1.15 EXCHANGE OF INFORMATION

A. Electrical equipment and material installed in congested or problem areas and not coordinated by this Contractor prior to the installation of same shall be relocated should they interfere with proper installation of equipment and material to be installed under other sections of the Specification.

B. Particular attention shall be directed to the coordination of systems with the equipment and material specified under other sections of the specifications to be installed in the ceiling spaces. Coordinate with the other trades the elevations of all equipment and materials in hung ceilings areas to insure adequate space for the installation of recessed fixtures before the equipment is installed.

C. All information relative to required openings, equipment sizes, sequence of installation and interfacing requirements with other sections of the specifications shall be provided sufficiently in advance to allow for proper planning in the overall construction schedule.

D. The work must be performed so that the progress of the entire building construction including the work under other sections of the specification will not be delayed or interfere with. Materials and equipment shall be installed as fast as construction conditions of the building will permit and shall be installed promptly.

E. Coordinate the routing and termination points of all electrical work with approved shop drawings of other Sections of the Specifications requiring electrical connections to allow for the proper interfacing of same.

F. This Contractor shall conform and coordinate the locations of all materials and equipment specified under other sections of the specification as related to the installation of the electrical system under this Section to avoid conflicts.

G. Ascertain from approved shop drawings of other sections all information relative to electrical work to be executed under this Section for the installation and operation of approved electrical equipment.

1.16 DISPUTES, PRACTICES AND PATENTS

A. The Architect shall be responsible for settling all jurisdictional disputes, labor practices and claims for infringement as related to the work and materials under this Section if such problem should arise.

1.17 OPENING AND AISLES

A. Examine the architectural drawings for the locations of suitable openings and aisles available for the passage of materials and apparatus to be installed under this Section. This Section shall include the responsibility for having the openings left open until the equipment has been properly installed.

1.18 HANDLING OF MATERIALS

A. Receive and accept at the site, properly handle, house and protect from injury and the weather until ready for installation, the following materials.

1. Materials, equipment and apparatus furnished under this Section.

2. Electrical control equipment furnished under other sections of the specifications; and to be installed under this Section.

B. Equipment damaged in the course of handling, installation or test shall be replaced under this Section or repaired to the satisfaction of the Architect without any additional charge.

C. Trailers for storage of electrical materials and equipment shall be provided under this Section. Trailers shall be located in designated staging areas at the site.

1.19 PROTECTION

A. It shall be the responsibility of this Contractor for the maintenance and protection of all materials and equipment provided during all phases of construction from loss, damage or deterioration until final acceptance by the Architect.

1.20 DAMAGE TO OTHER WORK

A. This Contractor shall be held responsible for and shall pay for all damage to other work caused by his work or workmen.

B. Repairs of such damages shall be repaired or replaced by this Contractor to the complete satisfaction of the Architect.

1.21 RUBBISH REMOVAL

A. Just prior to the completion of the daily work, this Contractor shall remove from the property all rubbish or waste materials belonging to him. Keep the jobsite free from accumulation of waste materials and rubbish.

1.22 INSPECTIONS

A. Work shall not be permanently concealed before inspection and approval by the Architect, and all inspectors and authorities having jurisdiction.

B. Replace any unacceptable, imperfect or condemned material, equipment or workmanship so as to comply with the intent of the Contract Documents and satisfaction of the Architect and Inspection Authorities without extra cost.

C. Work installed under this Contract that is covered before inspection and approval of the appropriate inspecting authority, this Contractor shall pay all costs of uncovering and reinstalling said work. This shall include all underground conduits and Electrical site utilities work included under this Section.

1.23 CERTIFICATES OF APPROVAL

A. Upon completion of all work, furnish the Architect, in duplicate, certificates of inspection or approval from state, federal and local inspection authorities having jurisdiction.

B. Furnish the Architect, in duplicate, notarized letters from the manufacturer of the fire alarm system stating that authorized factory engineers have inspected and tested the installation of the system and found same to be in perfect operating condition. All discrepancies and defective materials, if any are to be rectified and replaced before the above requested letters are notarized.

1.24 GUARANTEE

A. Work under this Section shall be guaranteed free from defects as required under Division 1.

B. Where defective work results in damage to work of other Sections, all such work shall be restored to its original condition by mechanics skilled in the affected trade, at the expense of this Contractor.

C. Standard equipment guarantees offered by the equipment manufacturers for two years or greater shall be in addition to that as requested by this Contractor.

1.25 RECORD DRAWINGS

A. The Contractor shall refer to Division 1 of the Specifications for the requirements and procedures pertaining to the Record Drawings.

1.26 SCHEDULE OF VALUES

A. This Contractor shall submit a breakdown of his contract prices to aid the Architect in determining the value of work installed as the job progresses. The breakdown shall be as follows:

1. Underground duct bank systems to interfacing points for the site utility work.
2. Secondary distribution system throughout the building.
3. Branch circuit work.
4. Lighting systems.
5. Wiring equipment and connections for elevator, HVAC, fire protection and plumbing systems.
6. Fire alarm system.
7. Grounding system.
8. Empty raceway systems for telephone and cable television.
9. Cabling requirements for telephone and cable television.

B. Other items when specifically requested by the Architect.

C. No requisitions will be paid to this Contractor until after the breakdown is delivered to the architect.

1.27 SAFETY PRECAUTIONS

A. Safety regulations established by OSHA shall be maintained throughout the entire construction period of the project.

1.28 CONTRACTOR'S RESPONSIBILITY

A. The undertaking of periodic inspections by the Architect or his representative shall not be construed as supervision of actual construction nor make either of them responsible for providing a safe place for the performance of work by this Contractor, for visitors to the site or occupants nor make them responsible for omission of any safety device called for by codes, ordinances or by the Specifications of the manufacturers of the equipment supplied. This Contractor shall be responsible for providing a safe building electrically for all workman, visitors and occupants until the building has been accepted by the Architect.

1.29 QUIET OPERATION

A. Electrical equipment shall operate under conditions of load without sound or vibration which is abnormally objectionable for such equipment in the opinion of the Architect. Sound or vibration noticeable outside of the room in which it is installed, or annoyingly noticeable inside its own room will be considered objectionable. Sound or vibration conditions considered objectionable shall be corrected in approved manner at no change in contract amount.

1.30 PAINTING

A. All field painting, except as specified herein, will be included under the Section for PAINTING.

B. After installation, equipment and accessories with factory primed or finished painted surfaces shall be cleaned and bare or marred spots touched up under this Section with the same grade and color paint as applied at the factory.

C. Nameplates on all equipment shall be cleaned and left free of paint.

1.31 MOTORS

A. Motors shall be built in accordance with latest standards of NEMA and as specified. Motors shall be specifically and expressly wound for standard NEMA voltage ratings, and shall be high power factor and high efficiency.

B. Motors shall be tested in accordance with standards of ANSI C50 and conform therewith for insulation resistance and dielectric strength.

C. Motors shall be provided with adequate starting and protective equipment as specified or required and with conduit terminal box of size adequate to accommodate conduits and wires as sized on electrical drawings or as specified under this Section.

D. Capacity shall be sufficient to operate associated driven devices under conditions of operation and load and without overload and at least horsepower indicated or specified.

E. Motors shall be suitable for continuous duty at rated horsepower with temperature rise not to exceed 40 degrees C for drip proof motors, 50 degrees C for splash proof motors, 55 degrees C for totally enclosed motors. All motors except totally enclosed shall be capable of 15 percent continuous overload without overheating.

F. Direct connected motors shall be furnished with adjustable base. Motors connected to driven equipment by belt or shaft shall be furnished with adjustable sliding bases, except fractional horsepower motors, which shall have slotted mounting holes.

G. Motors shall have nameplates giving manufacturer's name, serial number, horsepower, speed efficiency, power factor and current characteristics.

H. Motors smaller than 1/2 horsepower shall be capacitor-starter or split-phase type designed for 120 volts, single phase, 60 cycle operation unless otherwise specified.

I. Motors 1/2 horsepower and larger shall be squirrel cage induction type designed for 208 volts, three-phase, 60 cycle operation unless otherwise specified.

J. Motors 20 horsepower and larger shall be suitable for reduced voltage auto-transformer or wye-delta type starting as indicated on the drawings unless noted otherwise.

K. Motors at full load shall have the following minimum efficiency and power factor ratings at 1800 RPM. The ratings listed below shall also be used as a reference point for motors rated at other than 1800 RPM.

	PF	Efficiency
Up to 2HP	79.0	81.0
3HP to 5HP	85.0	84.0
7-1/2HP to 10HP	86.0	89.0
15HP to 30HP	85.0	91.0
40HP to 60HP	87.0	93.0

L. Starters for motors 20 horsepower and larger shall have time delay relays AGASTAT Model #DE-R-12 in the coil circuit to stagger motor starts thereby eliminating excessive inrush current in the electrical system.

M. Motors installed exterior, exposed to the elements, shall be of the weather protective type with encapsulated windings.

1.32 TEMPORARY LIGHT AND POWER

A. Provide temporary light and power in conformance with the requirements of Division 1.

1.33 INTENT

A. It is the intent of the Electricl Section of the Specifications and the Electrical Drawings to call for finished work, tested and ready for operation. Any apparatus, appliance, material or work not shown on drawings but mentioned in the Specification, or vice versa, or any incidental accessories necessary to make the electrical installation complete and perfect in all respects and ready for operation, even if not particularly specified, shall be furnished, delivered and installed under this section without additional expense to the Owner. Discrepancies or a question of intent shall be referred to the Architect for decision before ordering any materials or equipment, or before the start of any related work, and the interpretations of the Architect shall be final, conclusive and binding.

1.34 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Prior to completion of the Contract, provide operating instructions to the Owner's designated representative with respect to operation functions and maintenance procedures for all equipment and systems installed. Thoroughly instruct the Owner's representatives in the operation of all electrical systems and components to the complete satisfaction of the Owner. Advise the Owner's representatives as to the location of all electrical equipment associated with the various systems.

B. Submit six (6) copies of operation and maintenance data books to the Architect for approval. If the data books do not meet the following requirements, they will be rejected. Data books that are rejected shall be corrected and resubmitted to the Architect.

1. Provide data in book form with rigid covers, 8-1/2 inches by 11 inches, or 11 inches by 17 inches, and a maximum of 2-1/2 inches thick.

2. Provide data on all lighting fixtures, motor starters, contactors, relays, switching equipment, panelboards, loadcenters, distribution panels, meterbanks, fire alarm system, time clocks, photo-control cells and other electrical systems or equipment provided under this Contract.

3. Provide index and thumb tabs for each item or class. Group materials for any one item.

4. Provide the following information as applicable.

   a. Identifying name and number.

   b. Complete nameplate data.

   c. Performance curves and data.

   d. As-built wiring and control diagrams.

   e. Manufacturer's operating and maintenance instructions.

   f. Complete parts list with recommendation for spare parts to be stocked by the Owner.

g. Name, address and telephone numbers of nearest parts supplier and/or service company.

h. Any other important information as pertinent to the particular item.

C. Upon completion of all instruction to the Owner's designated representatives submit to the Architect a completed "Instructions to the Owner" form including all signatures, dates and other pertinent information. The submittal of this form to the Architect is the prerequisite to final payment.

1.35 DEFINITIONS

A. As used in this Section, the following items are understood to have the following meanings:

1. The Architect shall mean the Roxbury Corners Housing Project or their Authorized Representative.
2. The Contractor shall mean the Electrical Trade Contractor performing the work under this Section.
3. Furnish shall mean purchase and deliver to the project site, complete with every necessary appurtenance and support.
4. Install shall mean unload at the delivery point at the site and perform all work necessary to establish secure mounting and proper operation at the proper location in the project.
5. Provide shall mean "Furnish" and "Install".
6. Work shall mean all labor, materials, equipment, apparatus, controls, accessories, and all other items required for a proper and complete installation.
7. Work by others means work not provided under this Section of the Specification but work furnished and/or installed under other Sections of the Specifications within this Contract.

PART 2 - PRODUCTS

2.01 GENERAL

A. Materials and equipment included under this Part and required for the proper installation and operation of the electrical system shall comply with the applicable requirements of Part 1 of this Section.

2.02 RACEWAY SYSTEMS

A. Raceways (rigid and intermediate metal conduit, non-metallic conduit, flexible metal conduit, liquid tight flexible metal conduit and electrical metallic tubing) shall be a minimum of 1/2 inch trade size.

B. Rigid and Intermediate Metal Conduit, and Electrical Metallic Tubing:

1. Materials shall be high grade mild steel.

2. Exterior coating shall be zinc applied by electro-galvanizing, hot dipped galvanizing, or sheradizing on entire conduit, including threads. Baked clear enamel, lacquer, or zinc chromate coating shall be applied on top of zinc.

3. Interior coating shall be same as exterior coating.

4. Threads (rigid and intermediate metal conduit) shall be protected on both ends of standard length by conduit coupling or by tightly fitted plastic or fibre thread protector.

5. Couplings, elbows and sweeps (rigid and intermediate metal conduit): Only threaded type shall be used.

6. Couplings, elbows and sweeps (electrical metallic tubing): Only compression type shall be used.

7. Cast ferrous fittings shall be malleable iron, hot dip or electro-galvanized, with clear inert final coating, and with smooth, rounded, burr-free throat of smaller diameter than the threads. Cover shall be cast malleable iron with same coating as body and secured with brass or stainless steel screws. Fittings shall be manufactured by OZ/Gedney, Appleton, Crouse-Hinds, Midland-Ross, Pyle-National, Thomas & Betts.

8. Rigid metal conduit and electric metallic tubing shall be manufactured by Triangle/PWC, Wheatland, Republic Steel or Allied.

9. Electrical metallic tubing shall not be installed buried in concrete slabs, on grade or in any wet locations.

D. Flexible Metal Conduit:

1. Flexible metal conduit shall be single strip, continuous, flexible, interlocked double wrapped steel, galvanized inside and outside, forming smooth wiring channel.

2. Flexible metal conduit shall be manufactured by Pyle-National, Triangle/PWC or American Flexible Conduit.

E. Liquidtight Flexible Metal Conduit:

1. Liquidtight flexible metal conduit shall be similar to standard flexible metal conduit described above, except provided with tough inert, watertight plastic outer jacket.

2. Fittings shall be cast malleable iron body and gland nut, cadmium plated with one-piece brass grounding bushing which threads to interior of conduit spiral molded vinyl sealing ring between gland nut and bushing and nylon insulated throat as manufactured by OZ/Gedney, Appleton or Thomas & Betts.

3. Liquidtight flexible metal conduit shall be manufactured by OZ/Gedney, American Flexible Conduit, Electri-Flex or International Metal Hose.

F. Non-Metallic Conduit and Fittings:

1. Non-metallic conduit and fittings used for installation in underground duct banks shall be PVC Type II. Non-metallic conduits used for direct burial services in the earth, in or under floor slabs where designated on the drawings or hereinafter specified shall be PVC Schedule 40. Ducts, conduits and associated fittings shall be manufactured by Carlon, Triangle/PWC or Robroy.

2.03 OUTLET, PULL, JUNCTION BOXES AND FITTINGS

A. Each outlet, junction or pull box shall be of the proper type, class and construction to suit the specific conditions encountered.

B. Outlet, pull and junction boxes shall, in general, be as follows:

1. Recessed interior outlet boxes shall be code gauge galvanized steel and shall be of the shapes and sizes to suit their respective locations and installations, and shall be provided with covers to suit their function and installation. Boxes shall be Midland-Ross, Appleton Electric Company, or Raco.

2. Outlet boxes shall be equipped with fixture stud or straps where required. Minimum box size for fixture, wall or switch outlets shall be nominal 4 inches by 4 inches.

3. Cable television wall outlet boxes shall be standard outlet box with bushed coverplate.

4. Telephone wall outlet boxes shall be standard outlet box with modular pin receptacle coverplate.

5. Large junction and pull boxes shall be code gauge minimum thickness galvanized steel with screw-on covers, unless otherwise noted. Box edges shall be square and shall be continuously welded. Provide cable supports for the support of all tiers of cables and conductors within the pull or junction boxes. Large junction and pull boxes shall be manufactured Keystone-Columbia, Lee Products or McKinstry Metal Works.

6. Screws, bolts, nuts and washers used in conjunction with the installation of all junction, pull and outlet boxes shall be of brass, bronze, or stainless steel.

7. Exterior surface mounted outlet and junction boxes shall be of cast metal with threaded hubs, NEMA Type 3R. Killark, Pyle-National, OZ/Gedney or Crouse-Hinds condulet type. Covers shall be cast metal and shall be gasketed raintight exterior type.

C. Locknuts and Bushings:

1. Bushings shall be galvanized malleable iron, threaded type. One inch and larger sizes shall be insulated type, with smooth rounded plastic shoulder cast securely over top of bushing. Grounded type insulated bushings shall have set screw for locking bushing to conduit, and mounting screw bolting solderless lug to bushing and shall be OZ/Gedney Type HBLG, Midland Ross or Thomas & Betts.

2. Provide bushings at all conduit terminations. Secure conduit to boxes and enclosures by means of double locknuts. Provide grounding bushings at all panels and pull boxes.

D. Expansion Fittings:

1. Undirectional Type - Sleeve joining two conduits, one of which telescopes into the sleeve, the other held in a threaded connection, permitting a maximum relative movement of four (4) inches between the conduit ends. Movable joints shall be watertight with insulating bushing on movable conduit end. Connect ends of conduit with bonding jumper. Use for exposed conduits and in hung ceilings. Expansion fittings shall be manufactured by OZ/Gedney Type EX sleeve with Type BJ bonding jumper; Crouse-Hinds Company, or Spring City.

2. Deflection Type - Flexible sleeve with threaded metallic end fittings to receive conduits. Copper braid bonding jumper concealed in sleeve assembly which shall be firmly held together by two stainless clamping bends. Will permit 3/4 inch deflection from normal in any direction. Use for conduit in slab or earth or where other then horizontal changes may be

encountered. Expansion fittings shall be manufactured by OZ/Gedney Type DX, Spring City or Crouse-Hinds Company.

3. Use at expansion joints and on conduits running between separate structures.

4. Install undirectional type with movable conduit end approximately at halfway point in sleeves.

E. Exterior Wall Conduit Seal:

1. Compound sleeve for conduit passing through waterproof foundations. Consists of threaded sleeve and pressure bushing, jointed by external flanged casing. All parts cast malleable iron, hot dipped galvanized. Entire assembly adjustable to fit wall thickness. Pressure bushing bears on internal sealing gland assembly which tightens around entering conduit. Casing provided with double flanges to block seepage and with ears for nailing to concrete form.

2. Close sleeve with temporary seal as soon as installed. After conduit is installed, tighten pressure bushing until gland seal is watertight.

3. Use for service conduits and all other conduits piercing exterior walls underground.

4. Exterior wall conduit seals shall be manufactured by OZ/Gedney Type FSK, or Link-Seal by Thunder Line Corporation.

2.04 WIREWAYS

A. Wireways shall be of the totally enclosed sheet steel type, complete with all fittings, tees, elbows, wire retainers, closure plates, hangers and component parts required for a complete installation.

B. Physical size, length, and internal cross sectional areas of the wireways shall be determined in the field by this Contractor to suit field conditions unless noted otherwise on the drawings.

C. Wireway systems shall be constructed of code gauge galvanized sheet steel with hinged cover. Straight sections of the wireway system shall be constructed of two separate pieces of sheet steel. One piece shall be used to form the sides and top, the other to form the cover. Captive screws, furnished as a part of the wireway system shall be used for sealing at all hinged covers and couplings at straight sections or fittings. The hinged cover shall be of the full length rust proof type.

D. Fittings, elbows, tees and straight sections of the wireway shall be provided with smooth and round edges to protect the wiring from abrasion. All welded seams and joints shall be ground and polished to remove slag and burred edges.

E. Wireway systems shall be provided with 1/2 inch and 3/4 inch concentric knockouts every six inches on center along the top and 1/2 inch, 3/4 inch, 1 inch and 1-1/4 inch concentric knockouts every 6 inches along both sides.

F. Sheet metal posts shall be factory primed with rust inhibiting phosphatizing coating and finished with ANSI No. 61 gray enamel. All hardware shall be cadmium plated to prevent rusting and corrosion.

G. Lengths, connectors and fittings of the wireway systems shall be U.L. listed and bear the Underwriters' Laboratories label. U.L. listing of lengths without listing of connectors and associate components or fittings shall not be acceptable.

H. The wireway system, all component parts and fittings, shall be by one manufacturer and shall be manufactured by McKinstry Metal Works, Lee Products or Keystone—Columbia.

2.05 WIRE AND CABLE - 600 VOLTS AND BELOW

A. Building system wire and cables rated at 600 volts and under shall be as hereinafter specified.

B. Conductors for the wiring of branch circuits, all motorized circuits, auxiliary system wiring and distribution feeder conductors shall be soft drawn copper and shall have a conductivity of not less than 98 percent of the ANSI standard annealed copper. Conductors shall bear the markings of the Underwriters' Laboratories, the AWG size, type insulation, maximum permissable voltage, the manufacturer's name and trade mark and shall be tagged for the year of the awarding of the Contract.

C. Conductor sizes, in general, shall not be smaller than those specified under this paragraph and in no case shall they be smaller than specific conductor sizes indicated or noted on the drawings.

1. Feeder, branch circuit, fixture tap and line voltage control conductor sizes shall be not less than #12 AWG, except #14 AWG conductors shall be utilized within the dwelling units where indicated.

2. Class 1 remote control and signal circuit conductors shall be not less than #14 AWG.

3. Branch circuit tap wiring from the last junction box to a point within the lighting fixtures where connections are made to the actual fixture, wiring shall be the full AWG size of the branch circuit wiring system and in no case shall it be smaller than #12 AWG. Branch circuit wiring passing through the wiring channels of continuous rows of lighting fixtures shall be not less than #12 AWG.

D. Conductor sizes up to but not including #8 AWG shall be of the single strand solid type; conductors #8 and larger shall be of the stranded type.

E. Wire and cables shall be 600V insulated and be as follows:

1. Branch circuit wiring for lighting and power up to and including #10 AWG shall be TW insulated. Branch circuit wiring #8 AWG and larger as well as all distribution and motor branch circuit feeders shall be THW insulated.

2. Fixture wiring shall be Type SF2.

3. Branch circuit wiring from junction boxes to recessed fluorescent fixtures and branch circuit wiring passing through the wiring channels of continuous rows of lighting fixtures shall be THHN.

4. Auxillary system wiring shall be THHN.

5. Branch circuit wiring within the dwelling units, type "AC" cable. Type "NM" cable may be utilized provided it's use is approved, for this building, by the local authority having jurisdiction.

6. Feeders from the meterbanks to the dwelling unit loadcenters, type "AC" cable if not restricted due to conductor size. If restricted by conductor size, wiring shall be THHN installed in approprately sized conduit. Said conduit shall be sized by this Contractor as required by code and to meet the needs of the indicated wire size.

7. Motor branch circuit wiring shall be THHN and shall be copper.

F. Insulated conductors and cables shall be U.L. listed bear the U.L. label and be manufactured by Anaconda Wire and Cable, Phelps Dodge Corporation, Rome Cable Corporation, General Cable Corporation or Triangle/PWC.

2.06 TOGGLE SWITCHES

A. Toggle switches shall be of the totally enclosed, flush tumbler type of suitable capacity for the intended load and shall be Specification Grade.

B. Toggle switch bodies shall be of the ivory phenolic compound, quiet indicating type with screw type terminals.

C. General lighting switches shall be 1-pole, 2-pole, 3-way or 4-way and be as manufactured by one of the following:

1. Single pole 20A, 120/277V AC rated:

Arrow-Hart	#1991 Ivory
Bryant	#4901 Ivory
P&S	#20AC1 Ivory
Hubbell	#1221 Ivory

2. Two pole 20A, 120/277V AC rated:

Arrow-Hart	#1992 Ivory
Bryant	#4902 Ivory
P&S	#20AC2 Ivory
Hubbell	#1222 Ivory

3. Three way 20A, 120/277V AC rated:

Arrow-Hart	#1993 Ivory
Bryant	#4903 Ivory
P&S	#20AC3 Ivory
Hubbell	#1223 Ivory

2.07 RECEPTACLES

A. Bodies shall be of ivory phenolic compound, unless noted otherwise, supported by mounting yoke having plaster ears and shall be Specification Grade. Receptacles shall be side or back wired with two screws per terminal. All receptacles shall be the grounding type and shall be connected to metal mounting yoke. A terminal shall be provided for ground wire on all receptacles.

B. Receptacles installed throughout the building unless specifically noted otherwise shall be mounted vertically with "U" slot on the bottom.

1. Duplex convenience receptacles 15A, 125V, U-slot grounding type shall be:

Arrow-Hart	#5252 Ivory
Hubbell	#5252 Ivory
P&S	#5252 Ivory

2. Duplex 20A, 120V, 1-phase, 3-wire, U-slot grounding type convenience receptacles shall be:

Arrow-Hart	#5739 Ivory
Hubbell	#5362 Ivory
P&S	#5362 Ivory

3. Single 20A, 250V, 1-phase, 3-wire grounding receptacles shall be:

Arrow-Hart	#5862 Ivory
Hubbell	#5462 Ivory
P&S	#5862 Ivory

4. Duplex 30A, 250V, 1-phase, 3-wire, grounding type convenience receptacles shall be:

Arrow-Hart	#5700 Brown
Hubbell	#9330 Brown
P&S	#5930 Brown

5. Single 50A, 250V, 1-phase, 3-wire, grounding receptacles shall be:

Arrow-Hart	#5709 Brown
Hubbell	#9367 Brown
P&S	#5950 Brown

2.08 DEVICE PLATES

A. Device plates for toggle switches, receptacles, telephone outlets, pilot lights and miscellaneous devices shall be of high-impact thermoplastic material. Plates must be of modern design having rounded edges and corners and be complete with color-matched mounting screws. Plates must be of one design throughout the building and shall conform to UL, CSA, NEMA and Federal Specification WP-455A standards. Engraving, required for GFI protected receptacles, shall be done by plate manufacturer. Plates shall be ivory and similar to Sierra "P" line as manufactured by P&S.

B. Device plates installed on the exterior of the building shall be of the flush vandalproof type with cylinder locking coverplate. One key shall be provided with each coverplate and shall be turned over to an authorized representative of the Owner upon completion of construction. The device covers and adapter frames shall be of the heavy cast aluminum or dull chrome plate brass type with anodized corrosion resistant finish and shall be manufactured by:

Arrow-Hart	#90200-WP Series
P&S	#4600 Series

2.09 PILOT LIGHTS

A. Pilot lights indicated on the drawings for use on 120V circuits, independently or with toggle switches, shall be rated 75W, 125V candelabra base sockets with 6W clear lamps. Pilot lights shall be:

Arrow-Hart	#1711
Hubbell	#427
P&S	#2152

B. Jewels for use with switches controlling motors shall be green; jewels for other purposes shall be red.

C. Neoprene gaskets shall be provided under all device plates containing pilot lamps to act as light seals.

2.10 MISCELLANEOUS GENERAL PURPOSE OUTLETS

A. Special and general purpose receptacles not specifically listed above under Paragraph 2.07 shall be of Specification Grade, brown phenolic compound finish and manufactured by Arrow-Hart, Bryant, P&S or Hubbell. Ampere, phase and the number of poles shall be as noted on the drawings.

2.11 JOINTS, TAPS AND SPLICES

A. 600 Volt Cable:

1. Wire cable connectors for #8 AWG and smaller shall be of the pressure indent type with an insulating cover equal to Buchanan Electric Products. Connections to motor leads shall be made with solderless lugs similar to Burndy Engineering Company.

2. Connectors for connections to lighting fixtures from branch circuit wiring shall either be of the pressure indent type with an insulating cover or of the pre-insulated, permanent pressure, electrical spring connector type encased in a metal housing and insulating cover equal to Buchanan Electric Products or Scotchlock Type "R" of the Minnesota Mining and Manufacturing Company, respectively.

3. Wire and cable connectors for #6 AWG and larger shall be of the bolted pressure type equal to OZ/Gedney Manufacturing Company or Burndy Engineering Company.

4. Copper Cables #1/0 AWG and larger shall be fastened with a connector requiring two (2) bolts.

5. Joints, taps and splices shall be covered with Scotch brand tape #33 or approved equal.

6. Equipment shall be as manufactured by Buchanan Electric Products Company, Burndy Engineering Company, Dossert Manufacturing Company, OZ/Gedney Manufacturing Company, Incorporated, or Thomas & Betts Company.

2.12 FIRE STOP SEALANTS

A. Fire stop sealants used to seal all openings around electrical raceway systems passing through floors and fire rated walls shall be of the fire retardant silicone foam type. The sealant shall be pliable in character capable of adhering itself to the surrounding surfaces within the void being filled. The sealant shall remain in the pliable state permitting normal building vibration and allowing for material expansion and contraction without cracking or crumbling.

B. The sealant shall remain soft and pliable to allow for the removal and/or addition of cables or conduits without the necessity of drilling holes. It shall adhere to itself perfectly to allow any and all repairs to be made with the same material.

C. The foam sealant shall be capable of being installed by a single tradesman, working from one side of a floor or wall. The chemical components of the foam shall come pre-measured and contained within a single, hand operated, disposable cartridge which is used for mixing and dispensing the foam. The foam shall also come packaged for use with power mixing/dispensing equipment. No special skills or extensive training shall be necessary to operate either the cartridges or the power equipment. Both shall deliver the correct ratio of the two chemical components of the foam without the possibility of error or the necessity of technical supervision.

D. The foam shall expand to surround all the items within the penetration and maintain pressure against the walls of the penetration. The foam shall cure within five minutes and be fire resistant at that time. No heat shall be required to further expand the foam to block the passage of fire, smoke, or water.

E. The foam sealant shall be nontoxic and nonallergenic before and after cure. The cured sealant shall have a density of between 17 and 22 lb/ft. The sealant shall prevent the spread of smoke, fire, toxic gases or water through the sealed openings either before, during or after a fire. The sealant mixture and thickness shall be capable of maintaining the required fire rating of the floor or fire wall into which it is installed as required by the NEC, Article 300-21.

2.13 ACCESS PANELS

A. Furnish access panels for access to all concealed parts of the electrical system that required accessibility for the proper operating and maintenance of the system. The access panels will be installed by the Contractor under the appropriate Section of the Specifications for the surface in which the panels are located.

B. Acoustic tile ceilings do not require access panels but shall be provided with colored tabs for identification of access areas.

C. All access panels shall be located in a workmanlike manner in closets, storage rooms and/or other non-public areas, positioned so that the component can be easily reached, and the size shall be sufficient for this purpose (minimum size 12 inches by 24 inches). When access panels are required in corridors, lobbies, or other habitable areas, they shall be located as directed by the Architect.

D. Access panels shall be prime painted with cylinder lock and two keys as manufactured by Inland Steel Products Company, "Milcor", Miami Care, Walsh-Nannon-Gladwin, Inc., "Way Loctor" or equal. They shall be as follows, for references:

Dry Wall Surface	"Milcor Type DW"

Masonry Construction	"Milcor Type M"
Stucco and Plaster Ceilings and Soffits	"Milcor Type AP"

E. Access panels shop drawings shall be submitted to the Architect for approval.

2.14 RACEWAY SEALS AND SEALING COMPOUNDS

A. Sealing compounds for raceways, ducts and fittings shall be putty-like consistency workable with the hands and shall not harden materially when exposed to air. The compound shall readily adhere to clean surface of fibre, or plastic raceways, concrete mansonry, lead rubber, polychloroprene, polyvinylchloride and common metals. The compound shall have no injurious effects on the materials or the hands of workmen. The compound shall form a seal with the above mentioned materials without dissolving, noticeably changing the characteristics or removing any of the ingredients. The sealing compounds shall be manufactured by Minnesota Mining, Johns-Manville or Dow Corning.

2.15 SUPPLEMENTARY STEEL, CHANNEL AND SUPPORTS

A. Furnish and install all supplementary steel, channels and supports required for the proper installation, mounting and support of all lighting fixtures, and electrical equipment, to be installed under this Contract as required.

B. Supplementary steel, channels, and supports shall be furnished, installed and secured with all fittings, support rods and appurtenances required for a complete support or mounting system.

C. Supplementary steel, channels, rods supports and fittings shall be Underwriters' Laboratories, Inc. listed, be galvanized steel, and be manufactured by Midland-Ross, Unistrut, Power-Strut, T.J. Cope or Chalfant.

2.16 NAMEPLATES

A. Nameplates shall be three-ply black bakelite with 1/4 inch high engraved white letters on the following equipment. Wording of the nameplates shall be in conformance with the respective schedules and notes on the drawings.

1. Secondary distribution panelboards -- nameplates shall be provided identifying each unit adjacent to each overcurrent protective device contained within same identifying the equipment which it protects.
2. Meterbanks -- nameplates shall be provided identifying each dwelling unit being serviced and the main. Said naemplates shall be located adjacent to each overcurrent device.

3. Motor starters -- nameplates shall be provided identifying each unit and the equipment which it protects.

4. Panelboards -- nameplates shall be provided on the exterior of each panel identifying same and located 1/3 of the way down from the top of same.

5. Nameplates shall be provided for each remote operating station, time clock, disconnect switch, pilot light and control device identifying the units controlled or protected.

6. Nameplates shall be provided for all auxiliary system equipment as indicated and included under other paragraphs of this Section.

2.17 GROUND RODS

A. Ground rods shall be 3/4-inch by 10 feet 0 inches long copper clad steel. If sectionalized, ground rods are used, each end of the ground rod section shall be threaded for extensions. Couplings shall be of the heavy gauge threaded bronze type designed to couple the rod sections together. A removable type driving bolt shall also be provided for driving of the ground rods to protect the couplings and rod ends from damage. Couplings and driving bolts are to be from the same manufacturer of the ground rods to be installed.

2.18 TIME SWITCHES AND PHOTOELECTRIC CONTROLS

A. Time switches (clocks) and photoelectric controls for control of lighting fixtures and equipment as shown on the drawings shall be of the heavy duty type with the required ratings and type of operating mechanism as indicated on the drawings. All time switches shall be provided with an internally operable omitting device that will permit the bypassing of the operating mechanism.

B. All time switches, in general, shall be mounted in NEMA 1 enclosures unless specifically noted otherwise on the drawings.

C. Time switches and photo electric controls shall be manufactured by Tork, Paragon or Sangamo.

2.19 DISCONNECT SWITCHES

A. Disconnect (safety) switches shall be of the HD, quick-make, quick-break type with interlocking cover mechanism and provisions for padlocking the switch handle in the OFF position.

B. Disconnect switches shall conform to the industrial standards set forth by NEMA. Disconnect switches shall be Underwriters' Laboratories listed and bear the U.L. label.

C. Disconnect switches shall be of the ampere and voltage ratings shown on the drawings, as required by the National Electrical Code and other applicable Specification Standards.

D. Disconnect switches shall be of the fused and unfused type as indicated and provided with the number of disconnecting poles indicated on the drawings. Except as specifically noted otherwise, all neutrals shall be of the solid type. Disconnect switches installed on the load side of the motor starters and ahead of the motor for multiple lead motors shall have a disconnecting blade for each hot or current carrying conductor.

E. Disconnect switches used in conjunction with motors shall be horsepower rated for the intended load.

F. Disconnect switch enclosures shall be of the proper NEMA type for the intended location as defined by the N.E.C. Disconnect switches shall be code gauge galvanized steel and shall be phosphate coated. The enclosures shall be finished ANSI #61 gray baked enamel.

G. Cable lugs of the proper type and size shall be provided on the line and load side of the disconnect switches.

H. Disconnect switches shall be manufactured by Square D, ITE, General Electric or Westinghouse.

2.20 FUSES

A. Secondary system fuses, rated at 600V or less, shall be Underwriters' Laboratories listed when such listings are published covering the types of fuses being used, and be constructed in conformance with the applicable standards set forth by NEMA and ANSI. Fuses 600V or less shall be manufactured by Bussman, Shawmut, or reliance and shall be as follows:

1. Fuses, except as specifically noted on the drawings or under other Sections shall be of the one time, NEMA J or L, nonrenewable cartridge type.

2. Fuses installed in disconnect switches or combination disconnect switch/starter for the potection of motor branch circuits shall be of the dual element, RK-5 series, current limiting, time delay type.

3. Fuses shall be installed with the proper NEMA type mounting clips. Adapters used in conjunction with standard N.E.C. fuse clips for the mounting of current limiting or dual element fuses will not be accepted.

2.21 BRANCH CIRCUIT AND DISTRIBUTION PANELBOARDS

A. General

1. Main and branch busses shall be tin platted aluminum, sized in accordance with Underwriter's Laboratories standards. Unless otherwise noted, full size neutral bars shall be included.

2. Busses shall be rigidly supported and insulated and shall be so designed that branch circuit breakers can be removed without disturbing adjacent units or changed without additional machining, drilling or tapping.

3. Necessary bussing, drilling, and blank plates shall be provided for installation of future circuits when so indicated on the drawings.

4. Screws and bolts used for making connections shall be equipped with lock washers. Riveted bus connections shall not be used.

5. Mains shall be equipped with solderless pressure indent type connectors for copper conductors and shall have means provided to prevent swiveling of connectors for cable size #2 or larger.

6. Busses shall be provided for all active, spares and spaces called for in the panel schedule.

7. Bus bars shall be flat and parallel to the panel cabinet. The phase and neutral bus bars shall be of the fully rated aluminum type with silver or tin-plated contact points. Single or multiple feeder cable terminal lugs shall be furnished with the panelboard to accommodate the panel feeder sizes and quantities shown on the feeder schedules. Subfeed lugs shall be provided in panelboards as indicated on the drawings. The main bus bar and maximum branch circuit capacity of distribution, branch circuit panelboards shall not exceed the following ratings unless specifically noted otherwise on the drawings.

   a. Distribution panelboards -- 1200A main bus bars with 800A maximum branch circuits.

   b. Branch circuit panelboards -- 100A or 225A main bus bars with 100A maximum branch circuits.

8. Boxes shall be minimum of 20 inches wide by 5 inches deep and constructed of code gauge galvanized steel. Trims shall have adjustable trim clamps and catch. Panels shall have provisions for mounting directories on inside of panel door.

9. Back pan or mounting pan on which busses and branches are mounted shall be rigid to properly support the component parts.

10. Distribution panels shall be of the fusible switch type; branch circuit panels shall be circuit breaker type.

11. Fusible switch distribution panelboards shall be of "QMR" type with interlocking cover mechanism and provision for padlocking the switch handle in the off position.

12. Circuit breakers shall have quick-make, quick-break, trip indicating, thermal-magnetic tripping for openings of breakers at the proper lag during overload and on short circuits as

required by the Underwriters' Laboratories. Breakers shall be of the bolted type totally enclosed in individual bakelite case and mounted into the composite panelboard assembly to permit removal of any breaker or breakers without disturbing the mounting of other breakers not to be removed. These breakers shall also be manually operated to the open and closed positions at will. The ON and OFF position shall be indicated on the operating handle of the circuit breakers. Circuit breakers shall be as follows:

a. 120/208V branch circuit panels -- 10,000 symmetrical RMS amperes for all breakers.

b. Circuit breakers used in 120/208V panels, for lighting circuits, shall be UL listed for switching of single pole lighting circuits.

13. Panelboards shall be provided with directories on inside surface of doors. Directories shall identify panelboards and indicate clearly circuit number and description of the associated branch circuit, allow at least three (3) lines for each circuit. Panels shall be keyed alike. Three (3) sets of keys shall be turned over to the Owner's representative prior to the final payment.

14. Each panelboard or distribution panelboard is to be provided with a ground bus.

15. Panels shall be finished ANSI #61 gray baked enamel and shall be as manufactured by Square D, ITE, General Electric or Westinghouse.

2.22 LOADCENTERS

A. Loadcenters shall be Square D type QO. Mains ratings and branch circuit breaker ratings shall be of size and number as indicated on drawings. Loadcenters shall be plug-on type construction. All current carrying parts of the bus assembly shall be plated. Terminals for feeder conductors to mains and branch neutral shall be UL listed as suitable for the type conductor specified. The loadcenter bus assembly shall be enclosed in a steel cabinet. The size of the wiring gutters and gauge steel shall be in accordance with Underwriters' Laboratories Standards No. 67 and No. 50. Fronts shall include door and be provided with a directory for circuit identification. Loadcenter boxes and fronts shall have corrosion resisting phosphate treatment and a gray baked enamel finish. Loadcenters shall be UL listed and meet Federal Specification W-P-115b as Type 1, Class 2.

B. Branch circuit breakers up to 150 amperes shall be Square D type QO, Q1 or approved equal. All breakers shall be plug-on type, toggle action with quick-mate, quick-break mechanism. Trip indication shall be clearly shown by the breaker handle taking a position between "ON" and "OFF" when the breaker is tripped and by VISI-TRIP indication. The VISI-TRIP indication consists of a highly visible tripped circuit indicator. The indicator is to be protected by a window which seals the breaker case. The VISI-TRIP indicator shall not be visible when breaker is "ON" or "OFF". All multi-pole breakers shall be single operating handle, common trip variety. Branch circuit breakers feeding convenience outlets shall have sensitive, instantaneous trip in order to give "flash protection" for frayed, stranded wire cords. QWIK-GARD circuit breakers with ground fault circuit interrupters shall be used in accordance with the National Electrical Code. Circuit breakers shall be Underwriters' Laboratories listed and meet the requirements of Federal Specification W-C-375B/GEN, Class 1 with a short circuit current equal to 10,000 AIC.

2.23 METERBANKS

A. Multi-metering equipment shall Square D wall mounted EZ METER PAK. All components shall have been tested and Underwriters' Laboratories listed for use as an integral part of the multi-metering system. Installation shall be made as herein specified and shown on the associated electrical drawings.

B. Enclosures shall be constructed of formed and welded code gauge steel. No device disassembly is to be required before mounting. Mounting shall be accomplished by using a separate mounting channel in conjunction with enclosure for vertical support. Final mounting shall be by the use of external mounting fees for attaching to walls. All devices must be bonded together with bolted connections. Meter units shall be provided with individual, removable covers for each meter position. All compartments containing unmetered circuits shall be provided with a sealing means.

C. All components shall be factory assembled and all current carrying parts shall be plated bus bars. Individual units shall be constructed with an integral sliding one bolt joint-pak assembly for a completely bussed meter center. This single bolt is to be a VISI-TITE bolt for tightening without a torque wrench.

D. Meter sockets shall be 4-jaw non-circuit closing type with 5-jaw provisions. Sockets shall be rated 200 ampere continuous duty. Meter socket jaws are spring reinforced and front removable.

E. Two-pole branch circuit breakers for 100 ampere devices, unless as noted, shall be Square D, two-pole, plug-on type QO.

F. Main device and meter/breaker components must be of such design to permit arrangement to allow wiring at the top or bottom in the same assembly. Equipment shall be so arranged as to permit the installation of units with different branch ratings in the same meter center.

G. The meter center shall be Underwriters' Laboratories listed with a short circuit current rating equal to 22,000 AIC.

2.24 MOTOR CONTROL EQUIPMENT

A. Starters, contactors and control devices used for the control of air conditioning, heating, ventilation and plumbing equipment being installed under this contract shall be suitable for operation with the equipment being provided by the respective Trades under other Sections of this specification. Coordinate the exact size and type of starting equipment required with the respective Trades prior to the submittal of motor control equipment shop drawings to the Architect for formal approval. If this Contractor should on his part fail to coordinate with the other contractors in obtaining the above referenced information relative to the types of starters and control circuitry required for each starter; then he, the Electrical Contractor, shall make any and all modifications or changes necessary to the effected starter or control circuitry or replace same with a new unit at his own expense. Motorized equipment used by this Contractor in determining the actual starter sizes, circuit and control configurations shall be taken from approved HVAC and Plumbing Shop Drawings of the equipment to be provided.

B. Equipment installed under this contract shall be of the proper rating for the intended purpose and the electrical characteristics of the building distribution system whether or not specifically indicated on the drawings.

C. Motor starters/contactors and control devices shall be of one manufacturer and shall be Square D, General Electric, Allen-Bradley or Westinghouse.

D. Equipment enclosures shall be finished ANSI #61 gray, and shall be of the proper NEMA type as required by NEC.

E. Magnetic and manual starters/contactors shall be of the size and voltage rating indicated and/or required by HP ratings. Magnetic starters/contactors shall be furnished complete with fused control power transformers and 120V control coil. Starters shall be provided with overload relays in each phase leg and single phase protection. The overload relays shall be of the ambient compensated type. Furnish starters and contactors with minimum of two normally open and two normally closed contacts, one used to maintain control circuit and the others as spares. Other auxiliary contacts and relays shall be added to starters/contactors as required for interlocking and control of HVAC equipment as indicated and as required by respective Contractors of other trades. Select the proper size overload heater for the actual motor furnished and installed in the field.

F. Control power transformers shall be as follows:

1. 100VA for size 1 starter/contactor.

2. 150VA for size 2 starter/contactor.

3. 300VA for size 3 and 4 starter/contactor

G. START-STOP pushbutton stations, selector switches, thermal magnetic switches and HAND-OFF-AUTOMATIC switches and other components as required for control equipment shall be of heavy duty machine tool type. Pilot lights for single speed starters/contactors shall be green "motor running" and red "motor stop". Pilot lights for two speed starters shall be blue "low", green "high speed" and red "motor stop".

H. Termination lugs of the proper rating, sizes and types shall be provided for all cable connections. Refer to the Drawings for the number, type and conductor sizes.

I. Motor thermal overload switches as shown on the drawings shall be of the heavy duty toggle single pole, single throw type with a bi-metal thermal relay suitable for interchangeable heaters. Contacts shall be of the silver butt type under constant spring pressure. A trip free operating level shall be provided to reset the switch when the switch has been tripped due to overload. Said switch shall be provided for all fractional horsepower motor which is not furnished with an integral overload protection.

2.25 LAMPS

A. Lamps of the proper type, wattage and voltage rating shall be furnished and installed in each fixture.

B. Lamps shall be delivered to the project in their original cartons and installed in the fixtures just prior to the completion of the project.

C. Incandescent lamps as required by the fixture manufacturer and/or hereinafter specified shall be inside frosted with minimum lamp life of 2500 hours and be rated for 130V operation unless specifically noted otherwise on the drawings and/or as hereinafter specified.

D. "PAR" and "R" lamps shall be of the spot or flood type and hereinafter specified with a minimum lamp life of 2000 hours and be rated for 130V operation. All "R" lamps shall be ellipsoidal in shape.

E. Quartz lamps shall be of the clear mini-base or diffused "PAR" type as hereinafter specified with a minimum lamp life of 2000 hours and shall be rated for 130 volt operation.

F. High pressure sodium lamps shall have a minimum lamp life of 24,000 hours, be rated for 208 volt operation.

G. Fluorescent lamps of all 430MA ratings shall be of the rapid start, energy savings, deluxe warm white type, having a minimum lamp life of 20,000 hours and be rated for operation on a 120 volt system unless specifically noted otherwise on the drawings and/or hereinafter specified.

2.26 BALLASTS AND TRANSFORMERS

A. Ballasts for fluorescent and HID fixtures shall be suitable for the proper operation of the lamps served. The ballasts shall be designed to serve the total lamp wattage and milliampere ratings of the lamps contained within the fixture, unless a special rating for a fixture is indicated on the drawings and/or hereinafter specified.

B. Ballasts shall be of the CMB/ETL high power factor type and bear the U.L. label.

C. Ballasts shall be suitable for operation on a nominal system voltage of 120V unless specifically noted otherwise on the drawings and/or hereinafter specified.

D. Fluorescent fixtures shall be provided with two lamp ballasts except where single lamp ballasts are required for odd lamp number fixtures. Three lamp ballasts shall not be used and will not be accepted.

E. Ballasts for fluorescent lamps rated at 430MA and under shall be "A" sound rated ballasts for fluorescent lamps. HID ballasts shall be "B" sound rated.

F. Fluorescent ballasts shall be of the watt reducing energy savings type equal to Universal "SLH" containing a thermal protective device that deactivates the ballast if its maximum case temperature reaches 110 degrees C. The thermal protector shall automatically reset when the case temperature drops below 85 degrees C.

G. Ballasts required for operation of other than fluorescent lighting sources shall comply with the acceptable standards for such equipment.

H. Ballasts utilized in exterior lighting fixtures and in unheated areas, shall be of the weatherproof encapsulated type suitable for operation in temperatures as low as 0^{O}F.

2.27 LIGHTING FIXTURES AND EQUIPMENT FABRICATION

A. Lighting fixtures and/or lighting equipment shall consist of all necessary parts, ballasts and hardware. Fixtures shall be factory assembled to provide a complete and operable luminous element to meet the specifications and approval of the Architect.

B. Metal fixtures and/or fixture parts shall be diecast, extruded, rolled, formed and of other manufactured process to provide the required product and finished elements as indicated. Finished products shall be free of flaws, pits or other irregularities either in production or working of the metal.

C. Lighting fixtures (standard and special) shall be U.L. listed. No exceptions shall be made. Fixture manufacturer shall furnish to the Architect via this Contractor notarized letters substantiating the validity of the U.L. label on their fixture if required. The letter shall include the U.L. test number and date when fixture was accepted by U.L.

D. The exterior finish (color) of all lighting fixtures designated in the specifications or on the drawings as having a special finish, the color shall be selected by the Architect during the construction period at the time of shop drawings review.

E. Lighting fixtures shall be as listed on the Fixture Schedule. The fixtures listed under each type shall be by the same manufacturer. If it is elected to furnish other than the fixtures manufactured by those specified, then the fixture proposed shall be equal, in every respect, to the product specified, including dimensions, finish, photometric curves, material and operating characteristics. Photometric curves of lighting fixtures submitted for approval shall be from an independent laboratory.

2.28 FIRE ALARM SYSTEM

A. Provide a complete and comprehensive Life Safety System comprised of fire detection, and signalling. Materials and equipment, as described herein shall be in accordance with the requirements of the State Building Code, as required by the City of Boston, Massachusetts, and any other authority having jurisdiction.

B. The equipment provided shall be UL listed for fire alarm use. The equipment furnished under this specification shall be the standard product of one manufacturer who has been engaged in productions of this type of equipment for at least ten (10) years, and has a fully equipped service organization within fifty (50) miles of the installation.

C. All components of the system shall be manufactured by the Autocall Division, Federal Signal Corp. or approved equal. Catalog and model numbers hereinafter are specified, are intended to indicate the type and quality of the design as well as the operating features required.

D. The Fire Alarm Systems shall be the zoned non-coded type. It shall be electronically supervised, common signaling, zone indication, automatic alarm type, operating from manual fire alarm stations, smoke detectors and thermal detectors or fire protection flow valves, Activation of any alarm device will:

1. Annunciate zone of alarm on fire alarm control panel and remote annunciator.
2. Sound all alarm horns and flash all visual fire indicators.
3. Send a common alarm signal to central station via the City of Boston connected master box.
4. Shutdown rooftop make-up air unit.

5. Recall elevator to lobby floor or lowest uninvolved floor.

Any disarrangement of system wiring such as loss of power, opens or grounds shall initiate the audible and visual trouble indicators by zone. The trouble lamp illumination shall be noncancelling except by an actual clearing of the system trouble. The audible trouble signal may be silenced by use of a trouble silence switch.

E. The control unit shall be modular and use solid-state components. Alarm initiating circuits shall meet the requirements of the National Electrical Code 760 for power-limited applications and shall function with up to 100 ohms resistance through alarm initiating device contracts and associated wiring. The control unit shall contain an internal audible trouble signal with silencing switch, system reset switch and lamp test switch along with individual zone LED's for trouble and ground faults. A trouble signal silencing switch shall be furnished, so that faults on the alarm initiating and indicating circuits signals can be silenced independently of each other. When trouble signals are silenced, the trouble signal shall restore to normal conditions automatically without manual restoration of the associated trouble signal silence switch, but only after the trouble condition has cleared. Disconnect switches and LED status lights shall be provided within the control panel to manually disconnect each of the zones from the system and a system switch to disconnect the fire alarm system from the remote control station service.

A common alarm and a common trouble relay shall be furnished. Each relay shall provide a dry form "C" contact wired to terminals.

All field wiring connections shall be made to terminals.

The control unit shall have a circuit for connection to a remote station-polarity reversal circuit. The circuit shall open in the case of a trouble condition and reverse polarity for an alarm condition. Alarm condition shall override the trouble condition.

A switch shall be provided to disconnect the remote station-polarity reversal circuit. An LED shall be provided and will indicate when the circuit has been disconnected.

The control panel shall have the capability to connect to a remote annunciator. The remote annunciator outputs shall be supervised.

The control unit shall have provisions for two supervised alarm indicating circuits. Circuits shall be supervised for opens, shorts or grounds. Each zone in the control unit shall contain an alarm and trouble LED and a zone disconnect switch. Each zone shall have two outputs for connection to a remote annunciator.

The control panel shall be provided with the number of zones as indicated on the drawings.

The control unit shall be Autocall Type MDE.

F. Manual Fire Alarm Stations will be non-coded semi-flush type. Stations will be double action with "Lift to Break" plastic shield. When operated, fire stations will remain mechanically latched until manually reset. Construction will be of rigid metal with raised lettering and clear plastic shield with lettering "Lift to Break-Pull Lever Down". Manual fire stations will be Autocall double-action Type 4051. Double-action stations requiring external hammer to break glass to gain access to actuating lever will not be acceptable.

G. Smoke detectors shall be of the solid-state photo-electronic type and shall operate on the light-scattering, photodiode principle. Detector shall be factory-set to detect smoke at a nominal 1.5% light obscuration per foot regardless of the rate of combustion, the distance between the detector and the fire source, the combustible material, the temperature of velocity of the smoke and whether the fire is in a confined area or open area. To minimize nuisance alarms, detectors shall be designed to ignore invisible airborne particles or smoke densities that are below the factory-set alarm point.

Detectors shall be listed by Underwriters Laboratories and approved by Factory Mutual under current standards for photo-electric type smoke detectors.

All smoke detectors shall be equipped with self-compensating circuitry to provide maximum stability against effects of aging, dust and film accumulation. The detector light source shall be an LED (light emitting diode).

Detector shall be equipped with a pulsed LED power supervisory indicator. The detector shall be designed to latch into alarm following a 6 to 10 second signal processing delay verifying the continued presence of smoke within the sensing chamber. An alarm shall be indicated by a steady red glow for the LED Indicator. Remote LED alarm indicators shall be located on the hung ceilings below the smoke detector located in the ceiling plenum. Provide as a part of the smoke detector and LED assembly sufficient cable to remotely locate the LED on the ceiling below. The LED cable sets shall be not less than six (6) feet.

A calibrated test feature shall be provided, capable of simulating a maximum acceptable amount of smoke for alarm. The test feature shall provide individual local testing of the detector and shall not require generation of actual smoke within the building.

For ease of maintenance and installation, detectors shall be designed for twist-lock mounting to a separate base assembly having screw terminals for external wire connections.

Smoke detectors shall be Autocall Type 4261-820/802.

H. Single station (120V) smoke detectors shall be similar to system type smoke detectors indicated above, except they shall be non-system 120 VAC operated and furnished with integral horn and suitable for tandum connection.

I. Duct mounted smoke detectors shall be of the automatic photoelectric type and shall be furnished by this Contractor. The detectors shall operate on the light-scattering, Photodiode principle. Detector shall be factory-set to detect smoke at a nominal 1.5% light obscuration per foot regardless of the rate of combustion, the distance between the detector and the fire source, the combustible material, the temperature or velocity of the smoke and whether the fire is in a confined or open area. Detectors shall be designed to ignore invisible airborne particles or smoke densities that are below the factory-set alarm point. A visual indication of an alarm shall be given when the normally-pulsed supervisory LED glows continuously. Automatic photo-electronic type smoke detectors will be Autocall Duct Type Smoke Detector 4260-026 with Remote Test Station 4260-052.

J. 1. Heat detectors shall be combination fixed temperature and rate of rise or fixed temperature only. Rate of rise element shall comprise calibrated, moisture proof, trouble free vented chamber with flexible metal diaphragm to close contact when temperature rise exceeds 15°F per minute. Contact shall be rated 3A, 28 V DC. Fixed temperature element shall comprise nonrestorable fuseable alloy element with external heat collector that drops for view when alloy fuses for visual indication of operation. Units shall be enclosed in white low profile dome shell with matching base.

2. Units shall be color-coded to indicate one of the following types:

a. 135°F fixed temperature and rate of rise (Autocall 601, 621).

b. 200°F fixed temperature and rate of rise (Autocall 604, 624).

c. 135°F fixed temperature only (Autocall 603, 623).

d. 200°F fixed temperature only (Autocall 604, 624).

K. The audio-visual alarm indicating device shall be of the semi-flush mounted, horn type with flashing strobe light mounted as a part of a common assembly. The bell shall provide a continuous ring as long as the bell is energized with the strobe light continuously pulsating. The bell shall be a db level of not less than 78 at a distance of 10 feet. The unit shall be rated for 24-volt operation.

The unit shall be Autocall 450-F/V33.

L. The annunciator panel shall be of the non-graphic flush mounted type. The annunciator shall be of modular construction with back-lighted annunciator windows. The annunciator shall be provided with a module test switch of the key type, lock-in type annunciation and module transfer relays. The annunciator shall be provided with the number of active and spare zones indicated on the drawings for the number of fire alarm zones plus a separate module built into the panel indicating the status of the emergency generator. The status lights for the generating system shall indicate essentially four (4) functions. "Generator Run" when the generator has started and is running; "Generator Fail-Start" when the generator has cranked and failed to start; "Emergency Power" when the transfer switch has transferred and emergency power is available; and "No Transfer" if the transfer switch has failed to transfer. The signals for the generator shall be taken from the generator control panel and automatic transfer switch. Contractor to coordinate the wiring requirements for the proper interfacing and connections of same.

The illuminated windows in the annunciator shall have the identify of all zones and functions silk screened or engraved in same. The enclosure cover shall be of the piano hinged cover type with cylinder lock and minimum trim. The enclosure cover shall be of the piano hinged cover type with cylinder lock and minimum trim. The enclosure cover door and frame shall be of extruded aluminum, finish (color) as selected by the Architect during the processing of shop drawings. Detailed shop drawings of the enclosure shall be submitted to the Architect for approval. The unit shall be Autocall type TLDD modified.

M. Operating power shall be 120V AC.

Standby battery and charger shall be furnished to operate alarm indicating appliances in the event of loss of 120V AC operating power. The batteries shall have sufficient capacity to sound alarms for a period of ten minutes after a 24-hour interruption of 120 V AC. The battery system shall be of adequate capacity to serve the basic requirements of the building plus the added audio/visual alarm devices and detectors to be added as a part of the tenant fit up work.

The batteries and battery charging equipment shall be mounted in the fire alarm control panel or in a separate cabinet located adjacent to same. All cabling and cable lugs for the battery system and between the battery system and the fire alarm control panel shall be provided as a part of the system.

N. The fire alarm master box shall be a Gamewell local-energy type, with Boston Fire Department lock and a telegraph sounder in place of tap bell located as shown on the drawings. The masterbox shall be mounted as a flush unit, using the appropriate backbox and trim by Gamewell. The master box shall be equipped with a micro-switch for the purpose of operating the interior alarm system should the master box be used to initiate the alarm. A #6 cable ground in rigid steel conduit shall be furnished and installed from the grounding terminal of the master box to a 3/4 inch by 10 foot long driven copperweld ground rod.

O. Flow and tamper switches, PIV valve and the dry valve alarm kits will be furnished and installed by the FP Contractor. This Contractor shall coordinate with the FP Contractor to insure that the equipment being provided by them under their phase of the work will be compatible for operation with the fire alarm system being installed under this Contract.

P. Elevator Recall -- the fire alarm system shall be provided with a fire alarm recall feature for the elevators. On activation of the fire alarm system the central control panel shall send a signal to the elevator controllers which shall activate same and return all of the elevators to the First Floor. The relays for the sending of the signal to the elevator controllers shall be located in the fire alarm control panel. Coordinate all work, relays and connections required with the Elevator Contractor.

2.29 APARTMENT INTERCOM SYSTEM

A. General:

1. Furnish and install an Apartment House Electronic Communications System as manufactured and distributed by SESCO, Inc., 60 Walnut Street, Dorchester, Massachusetts. The system shall include vestibule panels, postal release, apartment stations, door release, amplifiers and related equipment.

B. System Operation:

1. Operation of any pushbutton on the vestibule entrance panels by the caller shall sound the signal on the corresponding suitephone and light a light in handicapped units. The tenant may carry on a two-way conversation by the use of on-talk button. After determining the identity of the caller, the tenant may release the suitephone. The system, in general, shall consist of a selective signaling, common voice communications from the vestibules to all apartments.

C. Vestibule Entrance Panel:

1. Panel shall consist of as many call buttons as areas to be called, speaker microphone and appropriate index panel. the unit complete with exterior frame shall be housed in an appropiate metallic flush mounted back box. Panel shall be built in two sections. One section shall include numbered signal pushbuttons with a speaker in the center. The other section shall include a metal framed panel, including an index board bearing rows of plates for printed names and numbers. The speaker panel shall contain provisions for postal lock.

D. Power Supply:

1. The power sypply shall operate from 120 volts A.C. and provide D.C. output for signaling and talking. Unit shall be solid state and contain all circuitry required to accommodate the postal time delay feature.

E. Suitephones:

1. The cordless suitephones shall have the following components: pushbuttons switches (one for door release, one for talk and one for listen). The buttons shall be spring loaded plastic self-wiping switch. The loud speaker shall be 32-1/2", magnet .55 oz. The electronic tone shall be adjustable at amplifier. The unit shall measure 6"H x 5"W and be satin stainless steel and mounted on a two gang device. All lettering shall be engraved and stenciled in red. Suitephone units shall be SESCO Model 101. Suitephone that utilizes three buttons or lever switches shall not be acceptable. Handicapped units shall include a red call placed light.

F. Door Opener:

1. Door opener shall be a constant duty mortize type ED1 and shall replace the lock strike plate in the frame of the door. The unit shall be designed to operate on 16 volts, mounted for either left or right hand openings and be finished in brass under hardware.

G. Amplifier:

1. The amplifier shall be a fully transistorized unit containing a lockable, independent volume control for speech levels. The amplifier shall be designed to mount in the rear of the entrance panel for ease of service and to eliminate tampering. All wiring connections shall terminate on the top panel of the amplifier by way of terminal strips. The amplifier shall contain an adjustable time delay relay which when activated by the postal lock (located in the entrance speaker panel) will operate the security door lock and allow access. The amplifier shall be of intergrated construction frequency response adjusted for the best articulation. The housing shall be of rugged extruded aluminum construction with all electronic components mounted on plug-in printed circuit boards.

H. Guarantee:

1. All components shall be guaranteed for any and all mechanical and electrical defects, except that caused by misuse or abuse for one full years from date of completed installation.

2. Contractor shall be prepared to offer a service contract for maintenance of the system after the guarantee period.

I. Submittals:

1. The Architect through the Engineer shall be supplied with eleven copies of illustrations, specifications, descriptions, engineering data sheets of the equipment to be supplied for approval prior to commencement of any specified work.

2. Contractor shall provide all necessary information for proper efficiency.

    a. Diagrams and engineering data sheets of the equipment.

    b. Necessary information for proper installation, operation and service maintenance.

    c. Two maintenance manuals shall be provided to the Owner upon completion of the installation.

    d. Complete point wiring diagrams shall be submitted as part of the shop drawings detailing all components and the sequence of operation.

PART 3 - EXECUTION

3.01 GENERAL

A. It is the intent of the following sub-sections of this part to describe, in general, the installation requirements and the quality of workmanship required by the intent of this Specification. All major equipment and material shall be specified under Part 2 of this Specification. The installation shall conform to the requirements of the agencies listed under Part 1, Paragraphs 1.04, CODES, ORDINANCES AND REGULATIONS and 1.05, STANDARDS.

3.02 INTERIOR RACEWAY SYSTEMS

A. Provide throughout the building, except those systems, branch circuits and feeders which are indicated to be cabled, a complete raceway system for the installation of feeders, branch circuits, auxiliary system wiring required for the function and operation of all electrical and auxiliary systems specified. The raceway systems shall be complete in every detail and shall consist of all conduit, outlets, pull and junction boxes, fittings, hangers, supports and all appurtenances required to comply with the intent of this specification.

B. Raceways shall be thoroughly grounded and bonded in common. Regulations requiring bonding of conduit around outlet, junction or pull boxes shall be strictly adhered to. Threaded fittings and couplings shall be used for all conduit connections; threadless connectors and couplings shall be prohibited for all rigid steel and intermediate conduit work.

C. Raceways shall be fastened to all sheetmetal boxes and cabinets with two locknuts; one on the inside and outside of each box. Insulating bushings shall be provided as required by the National Electrical Code and other applicable specification standards.

D. Raceways concealed within finished walls, ceilings and floors shall be kept 6 inches from parallel runs of hot water pipes. Exposed raceways shall be supported at intervals of not more than five feet having runs installed parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceiling.

E. Turns, wherever required in raceways, shall be made by the use of factory ells and fittings. However, where field made bends are required, due to construction conditions, they shall be made with approved hickey or conduit bending machines. Where a multiplicity of conduits make the same turn, a code gauge steel junction box with removable cover may be used. When junction boxes accommodate more than two separate circuits, each circuit shall be grouped and bound with wire managers. Each feeder, branch circuit and auxiliary system cables shall be tagged in the pull and junction boxes. The tags shall indicate the point of cable origination and termination as well as the intended purpose.

F. Exposed raceways passing through walls or ceilings shall be fitted with chromium plated, spun or split type escutcheons. Pipe sleeves shall extend 3/4 inch above finished floor and be flush in walls, unless otherwise noted. All conduit sleeves passing through floors and fire rated walls shall be returned to the original fire rating of the floor or wall after the installation of raceways in same by means of filling the opening with a foam silicone material.

G. Vertical risers for lighting, power and auxiliary systems shall be properly supported at each floor.

H. The included drawings are, for the most part, diagrammatic and, except where definitely dimensioned, the locations of raceways and raceway systems shall be determined in the field. Concealed runs of raceways in floor slabs and walls shall be as short and direct as possible. Exposed raceways in unfinished areas and above hung ceilings or concealed behind removable panels shall run straight lines parallel to walls, ceilings, beams and columns and with right angle bends or threaded conduit fittings.

I. Crushed or deformed raceways shall not be installed and trapped raceways shall be avoided where possible. However, where traps cannot be avoided, a suitable means shall be provided for draining the raceways. Care shall be taken to prevent the lodgement of plaster, dirt or trash in raceways, boxes, fittings, and equipment during the course of construction. Clogged raceways shall be entirely free of obstruction or shall be replaced.

J. Raceways shall be carefully cleaned, blown and swabbed dry inside before installation of wires and cables. The Architect reserves the right to have all wiring in a raceway or raceways removed for inspection should the presence of moisture or dirt be detached in same at no additional expense. If moisture or dirt is found in the raceway system during the inspection of same, it will be thoroughly cleaned and dired to the complete satisfaction of the Architect at this Contractor's expense.

K. Raceways crossing expansion or control joints shall be provided with suitable expansion fittings or other suitable means shall be provided to compensate for the building expansion and contraction.

L. Wooden plugs inserted in concrete masonry blocks, brick or stud walls for the support of raceways, or pipe straps welded to steel structures shall not be accepted. Raceways shall be secured by pipe straps or shall be supported by wall brackets, wood, toggle bolts on hollow masonry units, expansion bolts on concrete or brick, and machine screws or welded threaded studs on steel work. Securing of raceways to hollow type stud wall or fibreboard construction shall be avoided.

M. Raceways in hung ceilings shall be run on and secured to the primary structural members of ceilings, not to lathing channels or T-bars, Z-bars or other elements which are the direct supports of the ceiling panels. Secure conduit firmly to steel by clips and fittings designed for that purpose. Maintain at least 1/4 inch air space between conduits and supporting walls. Each conduit in a bank of conduits shall be separately clamped. Supports for large banks of conduits shall be channel iron with U-clamps.

N. Raceways shall be run concealed in the hung ceilngs of the finished areas; exposed on the ceilings in unfinished mechanical/electrical spaces and storage areas where there are no hung ceilings. Not more than two 3/4 inch raceways (maximum trade size) shall cross each other in the floor slab at any one point. Raceways crossing locations in the floor slab shall be approved by the Structural Engineer and Architect prior to the pouring of the floor slab. Relocation of raceway crossing points in the floor slab required by the Structural Engineer shall be made by this Contractor at no additional cost. Raceway systems and outlets for branch circuit wiring shall be installed concealed in all new walls. Exposed raceways and surface mounted outlet boxes on new walls shall not be permitted.

O. Waterproof membrane of the structural floor slabs and foundation walls of the building shall be penetrated only at locations approved by the Structural Engineer and in a manner acceptable to the Architect. Proposed penetration points, size openings and method to be used shall be submitted to the Architect for approval prior to the installation of same.

P. Wiring shall not be pulled into the raceway system until it is mechanically complete in all details. The ends of the raceway shall be tightly plugged to exclude dust, moisture, mortar or plaster while building is under the process of construction. All accessible termination points of the raceway systems shall be properly capped or plugged by means of a plug or plastic cap until such time as a junction, outlet or pull box is installed on same or the raceway is extended to its final termination point.

Q. Provide a 1/8 inch nylon pull cord in all empty raceways. Pull cords shall be continuous from outlet to outlet and box to box. Pull cords pulled into raceways that are not to be activated at this time shall be secured at each terminal location so as to prevent backing into the raceway.

R. Galvanized, rigid metal raceways installed in the earth under floor slabs shall be given two coats of black asphalt paint after being made up and buried in the earth. Underground raceways installed in the earth under the building slab shall be covered by a minimum of 6 inches of earth.

S. Distribution, branch and auxiliary system raceways shall be properly sealed on both termination ends to prevent the entrance of water or other foreign elements.

T. Raceways for wiring, unless otherwise specified shall be as follows:

1. Feeders, mains, branch circuit work and auxiliary system wiring buried directly in the earth -- hot dipped galvanized

rigid or intermediate metal conduit painted with two coats of black asphalt paint. PVC schedule 40 conduit may be used if installed in compliance with the requirements of the NEC and local codes and is acceptable to the local inspection authorities. This Contractor shall provide an equipment ground conductor in all PVC conduits or ducts where used. Ground conductor shall be sized by this Contractor to comply with the requirements of the NEC.

2. Mains and feeders for power distribution shall be galvanized rigid metal or intermediate conduit where installed exposed or above hung ceilings.

3. Feeders for service to the dwelling unit loadcenters from the meterbanks -- armored cable (AC).

4. Branch circuit and auxiliary system wiring in furred and hung ceilings, block or stud walls -- thin wall (EMT) electro-galvanized tubing.

5. Branch circuit wiring in furred or stud walls -- flexible metallic conduit, EMT or armored cable (AC).

6. Branch circuit wiring within the dwelling units -- armored cable (AC) or if allowed by local authority having jurisdiction, non-metallic sheathed cable (NM).

7. Branch circuit and auxiliary system wiring concealed in slab work or pour concrete walls -- hot dipped galvanized rigid or intermediate metal conduit. EMT shall not be used in poured slabs or walls.

8. Branch circuit and auxiliary system wiring installed exposed -- Intermediate conduit or EMT in conformance with the N.E.C. and the requirements of other Specification Standards relative to the locations and conditions encountered. EMT shall not be used in any damp or wet locations.

9. Connections to portable equipment from junction boxes and connection of raceways to motor conduit terminal boxes -- liquidtight flexible metal conduit with a maximum length of 18 inches and a minimum length of 12 inches.

10. Flexible taps from junction boxes above hung ceilings to recessed fluorescent lighting fixtures shall be in flexible metal conduit. Length of flexible metal conduit from the junction boxes to the recessed lighting fixtures shall be 6 feet 0 inches long.

3.03 OUTLET, PULL AND JUNCTION BOXES

A. Furnish and install as an integral part of the raceway systems all outlet, pull and junction boxes required for the proper installation of all components of the electrical systems.

B. Outlet, junction and pull boxes shall be of sufficient volume and physical configuration to accommodate the number of conductors entering and leaving the box as well as any splices or connections that may be made within same. Outlet and junction boxes shall also be of schedule volume and physical configuration to accommodate all wiring devices mounted within or on same as well as the number of conductors, splices or connections to be made within same as indicated above.

C. The locations of all wall switch boxes shall be coordinated with the Architect before installation of same. All switch boxes, unless specifically noted otherwise on the drawings, shall be on the swing side of the door for all single doors and on the right hand wall for all double doors.

D. Location of outlets shown on drawings are approximate. Study of the building plans in relation to the spaces and equipment surrounding each outlet so that receptacles, switches, lighting fixtures, devices or other electrical components are symmetrically located and mounted in or on the walls, ceiling and floor. Receptacle boxes have been carefully located within the dwelling units to comply with the NEC (Article 210-52).

E. Outlet, junction or pull boxes, shown on the drawings, that interfere with the installation of mechanical equipment, structural or architectural features or that will be inaccessible due to the work of other trades shall be relocated accordingly, at no additional cost.

F. Outlet, pull and junction boxes shall be properly sealed during the course of construction to prevent the entrance of dirt and foreign materials within the same or the raceway system of which it is a part. Provide temporary covers for all open boxes. Paper may be solidly packed in standard work boxes to prevent the entrance of dirt and foreign materials, in lieu of coverplates.

G. Outlet, junction or pull boxes that are not specifically shown on the drawings but are required for the proper installation of the electrical system shall be installed so that they do not interfere with the structural or architectural features and the installation of materials by the other trades.

H. Reasonable changes in the location of outlets, pull or junction boxes requested by the Architect, prior to roughing, shall not involve additional expense.

I. Outlet, pull and junction boxes shall be installed in a rigid and satisfactory manner and shall be supported by bar hangers in frame construction or shall be fastened directly with wood screws on wood, bolt and expansion shields on concrete or brick, toggle bolts on hollow masonry units, and machine screws or welded threaded studs on metal. All outlet, pull and junction boxes shall be supported from the building structure independent of the raceway system. A space of 1/4 inch shall be maintained between exposed surface mounted boxes and walls. All outlet, junction and pull boxes shall be supported from the building structure independent of the raceway system.

J. Outlet, pull and junction boxes shall, in general, be as follows:

1. Exposed, surface and pendant mounted boxes or boxes installed in normally wet locations shall be of the cast metal type with threaded hubs.

2. Recessed boxes for non-hazardous locations shall be of the pressed sheet steel, zinc coated, cadmium plated type.

3. Outlet or junction boxes shall not be less than 1-1/2 inches deep, unless shallower boxes are required by structural conditions and are specifically approved by the Architect.

4. Ceiling and bracket outlet boxes shall not be less than 4 inches octagonal except that smaller boxes may be used where required by the particular fixture to be installed. Flush or recessed fixtures shall be provided with separate outlet boxes where required by the fixture terminal temperature requirements.

5. Floor outlet boxes shall be of the adjustable watertight type, single or multi-outlet, as required, complete with coverplate to accommodate the devices as indicated on the drawings.

6. Pull and junction boxes shall be constructed of code gauge galvanized sheet metal, of not less than minimum size required by the N.E.C. or other applicable specification "standards" and shall be furnished with screw fastened covers. Boxes exceeding 48 inches in any direction shall be properly reinforced with angle iron stiffeners.

7. Flush mounted ceiling and wall outlets boxes shall be provided with the proper type extension rings, tile and plaster collars required to set flush, with the finished surfaces of the ceiling or walls.

8. Pull boxes used to house both line and low voltage systems shall be provided with internal barriers to separate the systems. The barriers shall be of code guage steel and shall comply with the requirements of the NEC and local codes.

3.04 FEEDER, BRANCH CIRCUIT AND AUXILIARY SYSTEM WIRING

A. Provide throughout the building in the raceway system, except as noted otherwise; all feeder, branch circuit and auxiliary system wiring required for the function and operation of all electrical and auxiliary system specified. The entire installation shall conform to the intent of the requirements of this specification and shall be installed in compliance with all referenced specification standards.

B. Branch circuits, sub-feeders and feeders, are, in general, 3-phase, 4-wire, with one neutral conductor serving as "common". Where 4-wire circuits are used, one of the phase wires shall be connected to each phase of phase supply mains in order to assure a balanced condition in that circuit and proper load balance on the panelboard. Circuit numbers assigned on drawings are used for convenience only and need not necessarily designate the circuit on the distribution panelboard or panelboard to which the circuit may be connected.

C. Branch circuit, sub-feeder and feeder neutral conductors shall be full capacity unless specifically noted otherwise on the drawings.

D. Conductors or cables shall not be pulled into the raceway systems until all work which could cause injury to the conductors or insulation has been completed. A lubricant shall be used when necessary for the pulling of conductors and cables into the raceway systems.

E. Wire and cables shall be carefully handled during installation so as to avoid kinks, twists, and mechanical injury to the conductor, insulation or covering.

F. Where conductors are to be connected directly to devices with the use of terminal screws, such as at light switches, receptacles, and other wiring devices or screw type terminations, the wires shall be formed into a loop to fit around the screws in a clockwise direction so as to be tightly locked in place with same.

G. At no time shall more than one conductor terminate under one thermal screw.

H. Insulating compounds, unless indicated or specified otherwise, for cable joints, boxes, terminals, and other similar items, shall have a bituminous base and shall be free from granular content, creosote alkali, acid, sulphur and water.

I. Feeders, branch circuit wiring and auxiliary system wiring passing through pull or junction boxes shall be individually grouped and bound with wire managers. The conductors in each pull or junction box shall be properly tagged to clearly indicate their electrical characteristics, circuit number and panel designation. Cables shall be supported on suitable racks within the boxes and arranged in an orderly manner. The tags shall be of flameproof, non-conducting material and shall be attached to the conductors by means of a nylon cord.

J. Conductors shall be provided with identification markers at their terminal points. The markers shall be of flameproof cloth, vinyl plastic or aluminum foil with preprinted numbers. Conductor terminal tags for line voltage conductors shall be black numerals on white; conductors for all low voltage and auxiliary system conductor terminals shall be black letters on yellow.

3.05 FUSES

A. Furnish one complete set of fuses in all fusible type equipment, including the distribution panelboards and other fusible type disconnecting devices or switches as specified within this Specification, as shown on the drawings, as required by the N.E.C. and other applicable specification standards.

B. Furnish to the Architect at the completion of construction and before final acceptance of the building, one complete set of three (3) fuses for each different size and type of fuse installed in the building under this Contract.

C. Furnish and install a wall mounted fuse cabinet in the main electric room. Cabinet to contain one complete set of three (3) fuses for each different type of fuse utilized in the building. The fuse cabinet is to be provided with a built in lock. Keys for the cabinet shall be turned over to the Architect upon completion of the construction project.

3.06 GROUND SYSTEM

A. Equipment and systems installed and connected under this Contract shall be bonded and grounded in accordance with the standards of the latest National Electrical Safety Code, the National Electrical Code, and all State and local regulations as a minimum. Grounding and bonding requirements hereinafter specified or indicated on the drawings that exceed the requirements of the agencies indicated above shall be adhered to.

B. Furnish and install all material required for the grounding and bonding in the building, of all equipment, power and lighting systems, all as shown on the drawing or as specified as a minimum.

C. Continuity between all metallic and non-metallic raceways and equipment shall be maintained. Where non-metallic raceways are used in whole or as a part of a raceway system, equipment ground cables shall be extended from terminal point to terminal point and properly bonded. The raceway ground cable shall be TW insulated for branch circuit wiring systems; THW insulated for feeders. Insulated of the proper AWG conductor size to comply with the requirements of the N.E.C. and other governing agencies. Unless specifically noted otherwise, the equipment grounding conductor shall be copper. Where raceways cross expansion or control joints expansion fittings used shall include suitable bonding jumping to insure continuity of the grounding system.

D. Grounding conductors shall be, in general, as follows:

1. A minimum capacity of 15 percent of the rated capacity of the feeder to the equipment it grounds, unless otherwise indicated or required by the N.E.C. Refer to the drawings for the size of the main secondary ground conductor.

2. Minimum size of grounding conductors shall be not less than No. 14 AWG copper.

3. Grounding cables in non-metallic raceways shall have green colored insulation. Increase size of raceway if necessary to accommodate grounding wire.

4. Install grounding conductors in same raceway as phase conductors. Bond at each end of raceway, if necessary, to accommodate grounding wire.

5. Inaccessible and permanent connections shall be of the exothermic type.

6. Bolted connections shall be of the multiple bolt type, 2 bolts, washers and stop nut material -- high copper alloy, brass or silicon bronze. Ferrous hardware shall not be acceptable.

E. Grounding of panelboards shall be as follows:

1. Bond grounding bushing on feeder conduit to the ground bus in the main distribution boards and to ground lug in each panel with a ground conductor.

F. Grounding of motors shall be as follows:

1. Provide ground conductor from grounding lug in the respective power panel or loadcenter to motor frame. Terminate in motor conduit terminal box if the terminal is mechanically connected to motor frame. If this is not feasible, extend ground conductor through an insulated bushed opening in the connection box and connect to motor base.

3.07 RACEWAY SEALS

A. Conduits and ducts for incoming and outgoing electrical services to the building through the foundation walls shall be closed with seals set inside of the raceway systems at the foundation wall. The seals shall be installed so as to expand around the cables and the inside of the raceways when they are tightened so as to form a watertight seal.

3.08 SECONDARY DISTRIBUTION SYSTEM

A. Provide complete, a secondary distribution system for lighting and power, including feeders, sub-feeders, conduits, raceways, wireways, wires and cables, switches, fittings, contactors, controls, junction and outlet boxes, distribution panels, loadcenters, meterbanks, lighting fixtures, lamps, hangers, devices, and all other appurtenances incidental to and required for the complete installation of an electrical system in perfect operating condition.

B. In general, the electrical distribution system for lighting and power shall be extended from the main distribution panelboard to panelboards and equipment throughout the building at 208Y/120V, 3-phase, 4-wire for general lighting and motorized equipment. The dwelling unit service shall be extended from the meterbanks to the loadcenters at single-phase, 3-wire.

C. Wiring and Connections for HVAC and Plumbing Motorized Equipment:

1. Motors, dampers, and/or valves, pumps, fans, thermostats, temperature control devices, aquastats, etc. for the operation and control of HVAC and Plumbing and equipment will be furnished under Sections 15500 and 15400 of this Specifications unless noted or indicated otherwise.

2. Unless otherwise indicated, all power and interlock wiring for HVAC and Plumbing equipment shall be provided under this section of the Specification.

3. Provide all disconnect switches and starters that are not furnished as an integral part of the HVAC and Plumbing equipment making all electrical power and interlock wiring connections to same. Control wiring for the HVAC system and connections to the starting equipment will be provided under the HVAC work. Connections to starting equipment made by the HVAC Contractor to starting equipment provided by this Contractor shall be under supervision of this Contractor.

4. Provide all thermal switches required for the HVAC and Plumbing equipment that are not furnished as an integral part of a unit.

5. Provide all remotely located selector switches, stop-start stations and pilot lights including the control wiring to same for the operation of the Plumbing and HVAC system equipment. Provide the control wiring from the plumbing system control devices such as aquastats and others to the plumbing system pump starters and controllers.

6. Automatic temperature control system wiring and the devices required for the operation of same will be provided complete under Section 15500 of this Specification.

D. Building Equipment Wiring:

1. Provide and connect all raceways, fittings, switches, wiring and devices required for building service equipment that are relative to and part of this building contract. Obtain all required information, wiring and connection diagrams before the installation of any raceways or wiring for same.

2. Carefully review all architectural and equipment drawings during the bidding period for all such referenced building equipment that will require electrical connections.

E. Elevator Wiring:

1. Furnish, install and connect all required raceways, wiring, fittings, fused disconnect switches, devices, and other equipment as shown or required for the operation of the elevators.

2. Coordinate all work and the installation of same with the work required under the Elevator Section of this specification prior to the start of construction. Power wiring for the elevator shall be extended to and terminate at the line side terminals of the respective controllers under this section of the specifications. All wiring, equipment and connections from the load side terminals of the controllers and cab lights, safety switches will be furnished and installed and connected by the Elevator Contractor.

3. Disconnect switches for the elevators shall be of the fused type and shall be located as indicated by the approved elevator shop drawings. Provide in each elevator pit a duplex convenience outlet, lighting fixture and switch for the control of same. The exact location of the above referenced devices and lamps shall be as indicated on the approved elevator shop drawings.

3.09 FIRE ALARM SYSTEM

A. Provide complete in every respect, all equipment, raceways, wiring and connections required to provide a manual and automatic type fire alarm system throughout the building as shown on the drawings and as required by the intent of this specification.

B. Final connections shall be made under direct supervision of a representative of the manufacturer. The routing of all raceways through the Building shall be installed in a manner acceptable to the Architect.

C. Upon completion of the installation and before final acceptance of the building by the Architect, have a factory trained Engineer of the manufacturer inspect the system and shall obtain from him a notarized letter indicated that the system has been inspected and is in perfect operating condition. Defective material and operating features, if any, shall be corrected before the letter is issued by the equipment manufacturer.

D. The fire alarm system shall be interfaced with the City of Boston Fire Department through the municipal loop. Coordinate with the local fire department all interfacing connection requirements prior to the start of construction.

E. The fire alarm system shall be interfaced with the HVAC system for fan shut-down, and with the elevator controllers for elevator recall in the event of an alarm condition. This Contractor shall coordinate all wiring and connection requirements with the HVAC and Elevator Contractors in the field prior to the submission of shop drawings for approval.

F. This Contractor shall furnish, and electrically connect all duct smoke detectors. The duct detectors will be mechanically installed by the HVAC Contractor.

G. Coordinate all work with the Fire Protection Contractor as related to the installation of alarm valves, flow and tamper switch for the fire protection system as well as all connections required for interfacing with the fire alarm system.

H. The fire alarm system shall be installed in conformance with the drawings, as hereinafter specified and equipment manufacturer's shop drawings.

3.10 TELEPHONE SYSTEM

A. Provide complete in every respect a telephone raceway system (except as required within the dwelling units) including all conduits, wireways, terminal backboards, and outlets leaving the entire installation ready for installation of telephone and cables by New England Telephone.

B. Provide all cabling within the dwelling units as indicated including modular pin receptacles. The coverplates for said receptacles shall be of the same finish as other devices and switch plates throughout the building.

C. Telephone cabling and conduit system shall be, in general, as shown on the drawings.

D. Provide an 1/8 inch nylon pull cord in each conduit and duct to facilitate pulling of cables in the future.

E. All work and the entire installation of same shall be coordinated with the New England Telephone Company, and shall be in full conformance with their requirements and recommendations.

F. Wall outlet coverplates shall be provided with a factory bushed hole, except those indicated in paragraph 2 above, and be of the same finish and manufacturer as all other device and switch plates installed throughout the building. All telephone outlet coverplates shall be provided under this section of the specifications.

G. Telephone backboards shall be 3/4 inch plywood. Refer to the electrical plans for the size backboards required. Where specific size backboards are not indicated, provide a 4 foot by 8 foot by 3/4 inch backboards for the mounting of telephone and cable television equipment.

3.11 CABLE TELEVISION SYSTEM

A. Provide complete in every respect a cable television raceway system including all conduits, wireways, and outlets leaving the entire installation ready for installation of cables by the local cable television company.

B. Furnish and install all cabling within the dwelling units, cable type as indicated.

C. The conduit system shall be, in general, as shown on the drawings.

D. Provide an 1/8 inch nylon pull cord in each conduit and duct to facilitate pulling of cables in the future.

E. All work and the entire installation of same shall be coordinated with the local cable television company, and shall be in full conformance with their requirements and recommendations.

3.12 LIGHTING SYSTEM

A. Obtain all information relative to the exact type of ceilings and suspension systems that are to be installed in the various areas of the building before ordering any recessed fixtures. Furnish the proper type fixtures applicable to the ceiling framing system used. If other than the type of fixtures specified are required for installation due to the type of ceiling construction, furnish and install the proper type fixtures compatible for use with the ceiling system.

B. Coordinate the exact locations of all lighting fixtures with the ceiling pattern during the construction period and before installing the fixtures. Refer to the Architectural Reflected Ceiling Plan for the exact location of all ceiling fixtures located in areas where there are hung ceilings. Interferences between lighting fixtures, HVAC diffusers and other equipment shall be brought to the attention of the Architect.

C. Each lighting outlet shown on the electrical drawings and/or shown on the Architect reflected ceiling plans shall be provided with a fixture or other lighting equipment of the type indicated and specified. In the event a type designation is omitted at any outlet, furnish and install a unit typical of those in similar areas at no additional cost to the Owner.

D. All surface and pendant mounting fixtures as well as recessed HID and incandescent fixtures shall be hung and supported from the structure completely independent of any hung ceiling systems, ductwork and piping. Provide steel channels where required to span ductwork and piping. Ductwork and piping that has been installed by the other trades shall not be used to support lighting fixtures. Surface and pendant mounted fluorescent fixtures in finished areas of the building shall be provided with two support rods per four foot fixtures; three per eight foot fixture.

E. Recessed fluorescent fixtures shall be supported by the hung ceiling system. Coordinate the location of supporting ceiling system wires in the field to insure that proper support is provided for the lighting fixtures.

F. Provide all lighting fixtures, complete with standard or special tile mounting frames, and supporting attachments, plaster frames for all fixtures recessed in plaster, lamps, ballasts, self-aligning hangers and all other appurtenances required for a first-class installation.

G. All installed lighting fixtures and equipment shall be set or hung true and shall be proper alignment in both vertical and horizontal planes.

H. All installation fittings that are normally considered fixture parts, including hangers, yokes, channels, frames, stems and other appurtenances essential to a satisfactory installation of all lighting fixtures and equipment shall be furnished and positioned unless specifically noted otherwise.

I. Unless otherwise specified or accepted, wall fixtures that mount on outlet boxes shall be fastened rigidly by stud attachments. All ceiling or wall mounted trims, whether canopies, frames, flanges or other special mounting attachment shall be correctly aligned and firmly positioned.

J. All installed lighting fixtures and/or lighting equipment shall be free of light leaks, warps, dents, juts, paint imperfections, or other faults which are a result of poor workmanship in installation.

3.13 REMOVAL OF TEMPORARY LIGHT AND POWER

A. This Contractor shall abandon and rewire the temporary lighting and power services and stringers when so directed by the Architect. Temporary lighting stringers shall be removed from ceiling plenum spaces prior to the closing of same.

3.14 EXCAVATION AND BACKFILLING

A. Excavation and backfilling required for equipment and raceways installed under this Section will be performed under EARTHWORK. Location, depth of excavation and the routing of same shall be under the direct supervision of this Section.

B. Necessary protection and pumping work required to keep the excavation areas free of water will be provided under EARTHWORK.

C. Necessary bracings and shoring requested to protect the sides of the excavation will be provided under EARTHWORK.

D. Provide all required information as to the locations, sizes, grades and elevations of all conduit, equipment and foundations requiring excavation and shall be responsible for same.

3.15 SLEEVES, INSERTS AND PLATES

A. Maintain in proper position all sleeves, inserts and anchor bolts supplied and/or set in place under this section. In the event that failure to do so requires cutting and patching of finished work, it shall be performed as directed by the Architect.

B. Unless otherwise specified herein, all conduits and cables passing through floors, walls or partitions shall be provided with sleeves having an internal diameter one inch larger (minimum) than the outside diameter of the cables and/or raceways passing through same.

C. Sleeves through outside walls, structural grade beams or sump walls shall be Schedule 40 black steel pipe 150 pound black steel slip on welding flange at the center of the sleeve and shall be painted two coats of bitumastic paint inside and outside. In structural grade beams, the space between sleeve and conduit shall be packed with fire and waterproof foam silicon.

D. Unless otherwise indicated and/or specified herein, all sleeves through structural concrete floors and interior masonry walls shall be Schedule 40 black steel pipe, set flush with finished wall or set one inch above finished floor surfaces.

E. Sleeves through interior walls adjacent to all building expansion or construction joints shall be two conduit size diameters larger than diameter of conduit installed.

F. Sleeves through interior non-masonry partitions shall be 22 gauge galvanized sheet steel, set flush with finished surface of partitions.

G. Sleeves passing through lightproof or soundproof walls, floors and partitions and through fire rated walls shall be made tight using approved fireproofing foam silicon. The density and mixture of the foam, as a minimum, shall return the rating of the sleeve openings to the full fire rating of the floor or wall.

H. Core drilling, when required, shall be performed under this Section after receipt of approval by the Architect and his Structural Engineer.

3.16 FASTENINGS AND SUPPORTS

A. Except where otherwise shown or specified, the following shall be observed throughout the project.

1. Fastenings to wood: wood screws or lag screws shall be used.

2. Fastenings to brickwork, masonry or concrete shall be made with the use of approved expansion bolts or inserts, or self-drilling Bulldog type anchors and drive pins. Inserts shall be of the type to receive machine bolt head or nut after installation.

3. The use of "Ramset" or other powder actuated tools will not be permitted.

4. The use of wood plugs and nailing will not be permitted.

5. Perforated iron for supporting will not be permitted.

6. Fastenings to steel structures and iron works shall be made by the use of granular flux filled welded studs similar to Nelson Stud Welding, Division of Gregory Industries or mechanical supports similar to Korn Clamps and/or pipe straps.

7. Korn clamps may be used as means of fastening horizontal runs of conduit to purlins, deep steel members and the upper sections of column flanges. The use of "C" type clamps will not be permitted as a means of permanent support to vertical conduit risers at columns.

8. Steel channels and flat iron should be furnished and installed for the support of all electrical equipment and devices, where required, including all anchors, inserts, bolts, nuts, washers, etc. for a rigid installation.

9. Miscellaneous steel for the support of fixtures, boxes, starters, panels and conduits, shall be furnished and installed. Steel supports may be welded in place in accordance with applicable sections of the American Welding Society.

10. Approval must be received from the Architect before welding to any structural member.

11. The installation of all fastenings and inserts shall be included as a part of the work under this Section.

12. Supporting from suspended ceiling wires is prohibited unless approved by the Architect.

13. Building floor slabs and walls shall not be core drilled or cut without approval by the Structural Engineer and Architect.

14. Supplementary steel and channels shall be firmly connected to building construction in a manner approved by the Architect prior to the installation of same.

15. The type and size of the supporting channels and supplementary steel shall be sufficient strength and size to allow only a minimum deflection in conformance with the channel and supplementary steel manufacurer's requirement for loading.

16. Channels and supplementary steel furnished and installed under this section shall be hung from the building structure and not the support systems installed by other trades.

17. Unistrut and channels shall be run continuously under the ceiling channels and shall be coordinated with other trades for interferences.

18. Exposed raceway systems and lighting fixtures shall be hung by rod hangers and metal channels of proper size to support firmly and substantially the electrical raceway systems and lighting fixtures.

19. Raceway systems shall be properly secured to the channels.

3.17 PHASING AND COLOR CODING

A. Color coding shall be maintained for all feeders and branch circuit wiring throughout the project. Color impregnate insulation shall be used for all conductors up to and including No. 6 AWG. Conductors larger than No. 6 shall be identified by color banding tapes at all termination points, junction pull and outlet boxes.

1. Phases, neutral and ground conductors system shall be color coded as follows:

   a. Phase A - Red

   b. Phase B - Blue

   c. Phase C - Black

   d. Grounded Neutral - White

   e. Equipment ground conductor - Green

B. The distribution panels, motorbanks and panelboards shall be phased, "A", "B", "C", either top to bottom or left to right. The neutral, although it may be in different locations for different equipment, shall be identified.

C. Phase orientation and rotation shall be verified prior to placing equipment into operation. Adjustments shall be made prior to the completion of the work under this Contract. All motors shall be checked for proper rotation with adjustments being made as required for the proper operation of motorized equipment.

3.18 TESTS

A. This Section shall include the making of the necessary tests referred to herein in the presence of the Architect to show that the particular system or equipment has been properly installed and is in good operating condition, as hereinafter specified. The Architect shall be notified two (2) weeks in advance of the date for all tests so that he may be present to witness the tests.

B. Complete test and inspection records shall be made and incorporated into a report for each piece of equipment tested. Readings taken shall be recorded. Six (6) copies shall be submitted to the Architect for record and comments.

C. Furnish necessary meters, instruments, temporary wiring and labor to perform all required tests and adjustments of equipment and wiring installed and/or connected under this contract, including electrical equipment furnished by others, to determine proper polarity, phasing, freedom from grounds and shorts and operation of equipment. All measuring instruments shall be properly calibrated.

D. Materials and manner of installation shall be in strict accordance with the applicable requirements of state and local authorities, the Utility Company and the NFPA.

E. Following established procedures, equipment shall be energized after it has been determined by this Trade that the installation has satisfactorily been tested and ready to be placed in operation.

F. Wiring:

1. System and equipment grounds will be checked for proper value of resistance using the Megger ground tester in accordance with manufacturer's standard instructions.

2. Overall resistance of the ground system shall be no greater than 25 ohms. The grounding system shall be inspected to insure all above ground cables and connections are suitably protected. Provide additional ground rods, if required to obtain the specified resistance.

3. Ground resistance tests shall be made at all test points as required by the Architect. Ground resistance tests shall be made in accordance with the test procedures outlined in James G. Biddle Company Bulletin 25T2.

4. Correct or replace current-carrying circuits that are defective or grounded and correct all other defects encountered during the testing of the electrical systems. Defects whether through faculty workmanship or material furnished shall be corrected under this Section as a part of the Contract requirements.

G. Lighting: Check all lighting fixtures for proper operation and replace all noisy or defective ballasts and lamps.

H. Motors:

1. Make the following tests on all motors before start-up.

a. Check motor nameplates for H.P., speed, phase and voltage. Provide in the motor starters and contactors the proper size and type of thermal overload element required for the proper protection of the motor.

2. Make the following tests on all motors during or immediately after start-up:

   a. Check motor rotation. Motors rotating in the wrong direction shall be corrected.

   b. Take a current reading at full load using a clampon ammeter. If ammeter reading is over the rated full load current, determine the reason for the discrepancy and take the necessary corrective action.

3. Check all control devices, pilot lights and lockout switches to insure that they are properly connected. All lockout stations shall be operated to insure that motor control circuits will be de-energized, subsequently de-energizing the power feeder to the motors.

4. Overload elements in motor starters shall be checked for suitability to the motor characteristics. Replace any overload element that does not conform to starter manufacturer's recommendation based actual nameplate current rating of the motor. The cause of any motor operation above full load rating shall be investigated and the cause removed. Under no circumstances shall oversize overload relays be installed.

I. Fire Alarm System

1. The Contractor shall conduct tests of the system in the presence of the Architect.

2. At the completion of the work, the complete system shall be tested, by the approved service company, to the satisfaction of, and in the presence of, an authorized representative of the City of Boston Fire Alarm Division.

3. The test shall include all wiring and the proper operation of all equipment.

4. Tests shall be made of the operation of each automatic and manual alarm indicating device on the system, without impairing such alarm initiating devices.

5. Each device shall also be tested to ascertain that it operates on the designated zone and proper coding and also actuates the correct zone and trouble designation on the annunciators.

6. Additional tests shall be made as required by the Boston Fire Department.

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